

High Point Community Site Drainage Technical Standards



Prepared by
SvR Design Company for
High Point Community
Seattle, Washington
5/2004
Revised 6/2004

High Point Community: Site Drainage Technical Standards



TABLE OF CONTENTS

1 SUBMITTAL REQUIREMENTS	3
2 IMPERVIOUS SURFACE COVERAGE	7
2.1 Paving options	7
2.1a Porous gravel mats	9
2.1b Pavers on a porous base	10
2.1c Porous asphalt	10
2.1d Porous concrete pedestrian surface	11
2.1e Porous concrete vehicular surface	12
2.2 Pavement reduction options	13
2.2a Hollywood driveway	13
2.2b Reduced driveway length	13
2.2c Wheel stops	13
2.3 Impervious surface credit options	14
2.3a Rain garden	15
2.3b Stormwater planter	17
2.4 Sample applications	18
3 DRAINAGE DISCHARGE POINTS	22
4 ROOF AREA DRAINAGE LIMITS	23
4.1 Downspout options	25
4.1a Splash blocks	25
4.1b Rain barrels	27
4.1c Daylighting piped flow	28
4.1d Pop-up drainage emitter	29
4.2 Conveyance zone options	30
4.2a Conveyance furrow	30
4.2b Terraced conveyance furrow	33
4.2c Contoured land	34
4.2d Common yard conveyance swale	35
4.2e Conveyance garden	36
4.2f Stormwater planter	38
4.2g Dispersal trench	39



High Point Community: Site Drainage Technical Standards

4.3 Options at transition to ROW	41
4.3a Gravel level spreader	41
4.3b Plank level spreader	43
4.3c Yard drain	44
4.4 Sample applications	48
5 CHANGES TO THE PLAT	51
5.1 Unit lot modifications	51
5.2 Merging of parent lots	51
6 CONSTRUCTION MANAGEMENT	53
6.1 TESC during lot development	53
6.2 TESC during lot modifications	54
6.3 Routine NDS protection	54
6.4 Soil amendment	55
7 DEFINITIONS AND ABBREVIATIONS	57
8 SUGGESTED PLANT LIST	59
8.1 Conveyance furrow and rain garden floor/gravel level spreader	59
8.2 Conveyance furrow and rain garden banks/contoured land	59
8.3 Driveway centerline	60
8.4 Paver joints	60
RESOURCES	61

LIST OF APPENDICES

Appendix A: Permit Submittal Chart for Drainage Requirements
Appendix B: Sheet 23b of the Plat of High Point Community
Appendix C: Assumptions for sizing options
Appendix D: Downspout examples

LIST OF TABLES

1: Drainage Covenant and Plat of High Point Community	5
2.3: Impervious Surface Credit Options Sizing Requirements ..	14
4: Options for surface discharge of roof drainage	24
4.2a: Conveyance furrow depth	32



High Point Community: Site Drainage Technical Standards

4.2e: Conveyance garden dimensions	36
4.2f: Stormwater planter dimensions	38

LIST OF DETAILS

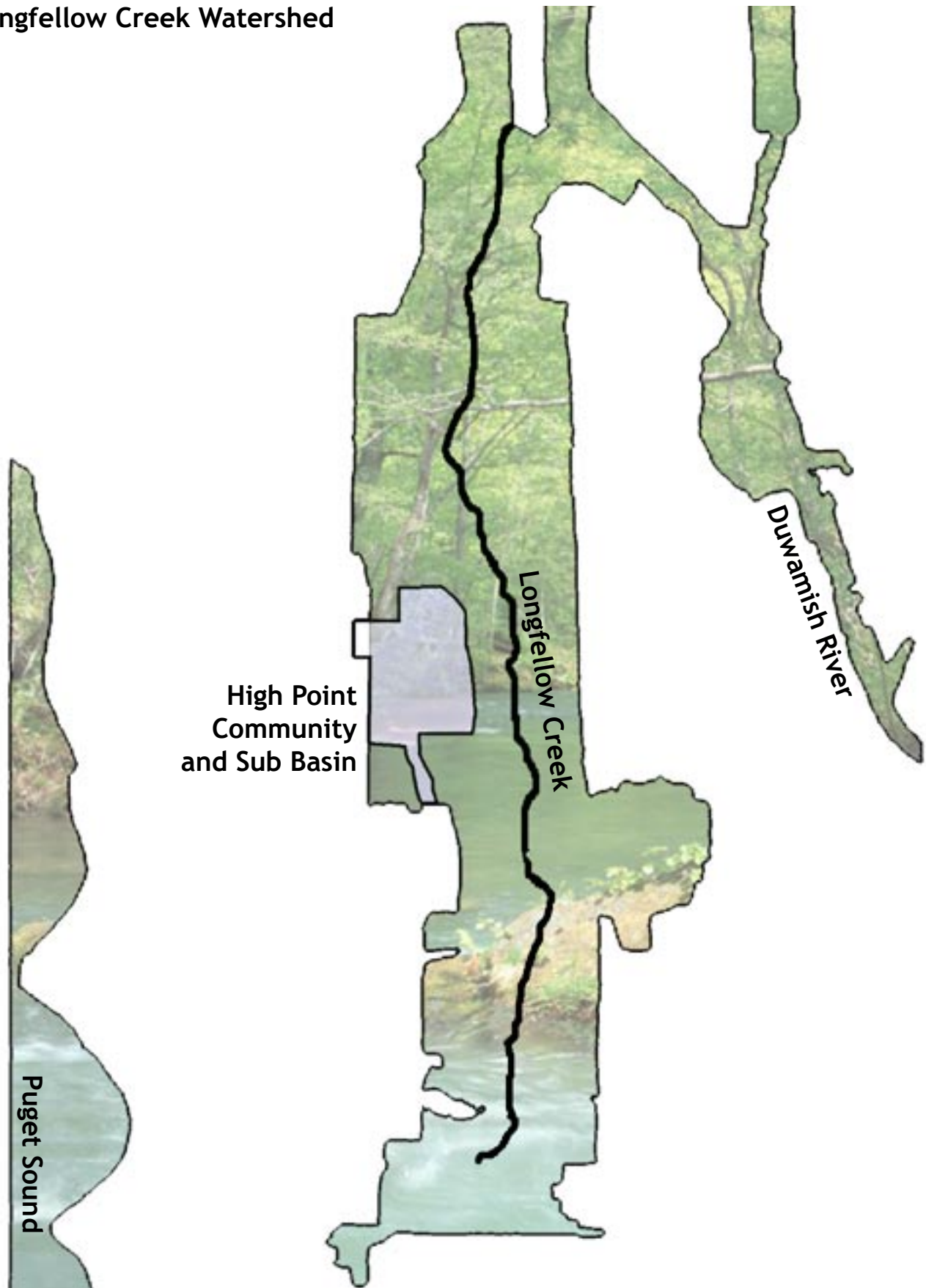
Porous gravel mat	9
Pavers on a porous base	10
Porous concrete pedestrian surface	11
Porous concrete pedestrian surface with drainage to conveyance furrow	11
Porous concrete vehicular surface	12
Driveway reduction	13
Rain garden	16
Stormwater planter	17
Splash block	26
Rain barrel connected to downspout	27
Daylighting piped flow	28
Pop-up drainage emitter	29
Conveyance furrow	31
Terraced conveyance furrow	33
Contoured land plan view	34
Common yard conveyance swale	35
Conveyance garden	37
Dispersal trench section	39
Dispersal trench plan view	40
Gravel level spreader plan view	42
Gravel level spreader section	42
Plank level spreader plan view	44
Plank level spreader section	44
Yard drain plan view	45
Yard drain section	46
Pipe to NDS section	46



High Point Community: Site Drainage Technical Standards



Longfellow Creek Watershed



High Point Community: Site Drainage Technical Standards



HIGH POINT COMMUNITY DRAINAGE

TECHNICAL STANDARDS MANUAL

The High Point Community is located within a sub-basin of the Longfellow Creek Watershed. Because High Point Community is a significant part of the Longfellow Creek system, the Seattle Housing Authority and the City of Seattle have partnered to provide a special natural systems drainage approach to enhance water quality and reduce peak flows draining to the creek. High Point Community's drainage goals, defined in the Drainage Covenant and the Plat of High Point Community, are achieved through a combination of public stormwater control systems and private drainage facilities.

Development within the High Point Community shall follow the detention and water quality requirements of the Plat and the Drainage Covenant as described in the full Drainage Report and these Site Drainage Technical Standards. The permit review of High Point Developments will be based on the technical requirements in this document, as approved by Seattle Public Utilities, the Plat and the Drainage Covenant rather than the City of Seattle Stormwater Code sections specific to water quality and detention.

Purpose

This manual provides applicants with a guide to address High Point Community's special drainage goals and to meet the requirements of the Drainage Covenant and Plat of High Point Community. Applicants will be required to construct and maintain a drainage system for the parent lots as part of the City of Seattle's permit requirements.

Because every site is different, it is important to design a drainage system that fits a site's specific conditions. This manual provides drainage options, construction requirements and maintenance guidelines.

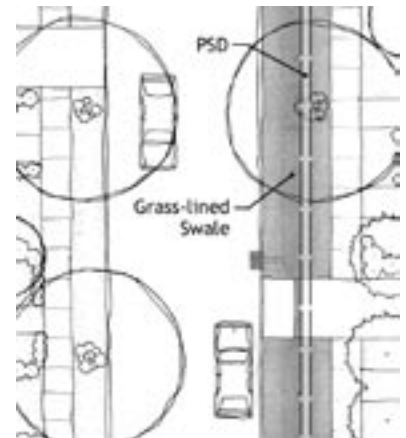
Each drainage option is described to aid in the selection of an appropriate approach to meet the drainage requirements. Included in each option's description is proper preparation and installation procedures, from soil modifications to material requirements.

Information on construction guidelines includes the protection of the Natural Drainage System (NDS) during site construction to minimize the impact of development on the NDS at High Point.

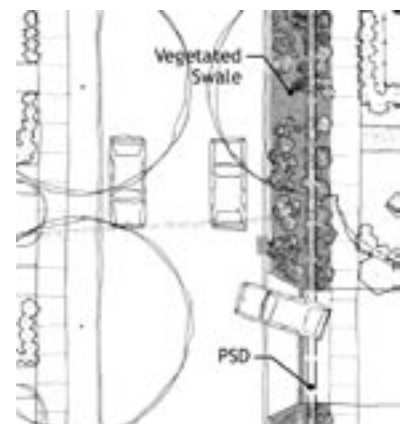
Finally, guidelines on maintenance are provided for site drainage systems, including protection during an establishment period of



Some swales in the NDS are vegetated



Grass-lined swale in the NDS with the PSD buried below



Vegetated swale in the NDS with the PSD buried below

High Point Community: Site Drainage Technical Standards

approximately one year, as well as long-term maintenance to ensure performance. Once established, the options included in this document should accommodate small storm flows.

The information in this document will be necessary to aid in the completion of the Permit Submittal Chart for Drainage Requirements (see Appendix A) and a site drainage plan. See section 7 for definitions of terminology used in this document.

1 SUBMITTAL REQUIREMENTS

The Drainage Covenant and the Plat of High Point Community have special drainage requirements.

Drainage Covenant and the Plat of High Point Community (see Appendix B) address the following:

- Impervious surface coverage limitations
- Designated discharge points
- Roof area drainage discharge limitations
- Procedures for Plat modifications

1.1 Drainage Covenant and Plat of High Point Community requirements

As part of both the Master Use Permit and Building Permit submittals, a Drainage Plan and Permit Submittal Chart for Drainage Requirements shall be required. These items shall meet the requirements specified in the Drainage Covenant and the Plat of High Point Community (see Section 2, Appendix A and Appendix B).

In addition to standard DPD requirements for Master Use Permit and Building Permit submittals, the following items are required.

- Parent lot site plan with existing and proposed impervious surfaces, buildings and roof outlines
- Parent lot grading plan with existing and proposed contours
- Parent lot drainage plan noting discharge points, downspout zone options, conveyance zone options and transition zone options (See sections 4.1, 4.2 and 4.3)
- Permit Submittal Chart for Drainage Requirements (see Appendix A)

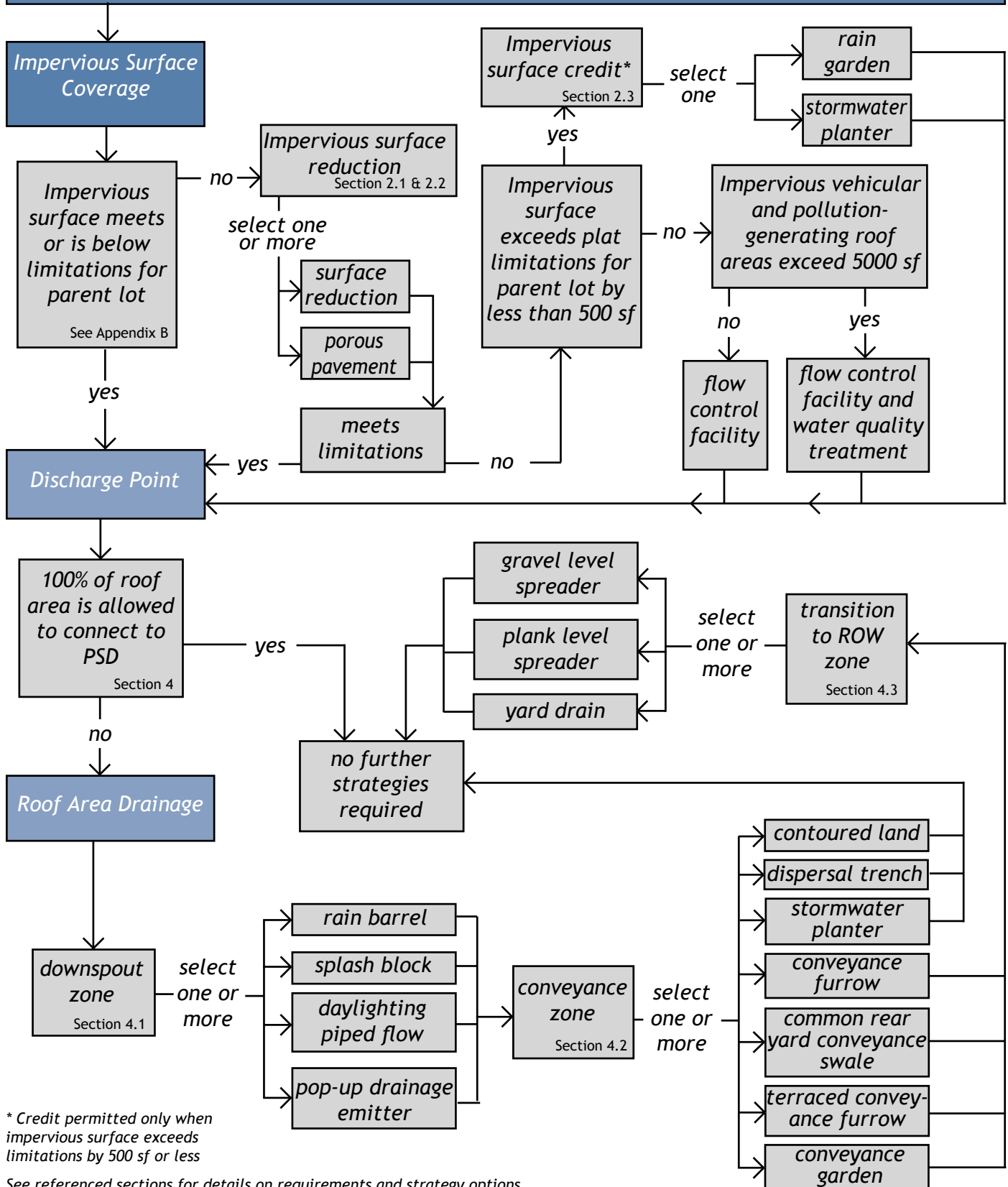
Applicants are required to choose drainage options from this manual or provide a design stamped by a professional civil engineer. Designs must be submitted to Seattle's Department of Planning and Development (DPD) for approval. Design shall meet the requirements of individual parent lots and the proposed development.¹ The options chosen may

High Point Community: Site Drainage Technical Standards

impact site grading design of the parent lot and private easements may be required. If an applicant's preferred option is not provided in this document, alternatives must include back-up calculations meeting the assumptions listed in Appendix C. The City's acceptance does not indemnify the applicant or professional civil engineer of responsibility for the design. Additional site specific geotechnical information may be required.

¹ For more information on these requirements see "High Point Drainage Covenant" or Sheet 23b of the Plat of High Point Community (see Appendix B for a copy of the Plat).

Table 1: DRAINAGE COVENANT AND PLAT OF HIGH POINT COMMUNITY REQUIREMENTS



2 IMPERVIOUS SURFACE COVERAGE LIMITS

Impervious surface coverage is limited on all blocks in High Point Community. The limits are based on land use, lot area and other factors. Impervious surface is any surface that blocks the infiltration of stormwater into the ground such as roofs, patios, porches, driveways, sidewalks and sheds.

Under the requirements of the Plat, the High Point Natural Drainage System provided for water quality and stormwater flow control.

Any proposed developments (or modifications to existing development) that exceed the allowed impervious surface coverage are required to reduce impervious surface area or provide a flow control facility sized for a minimum area of 2000 square feet.

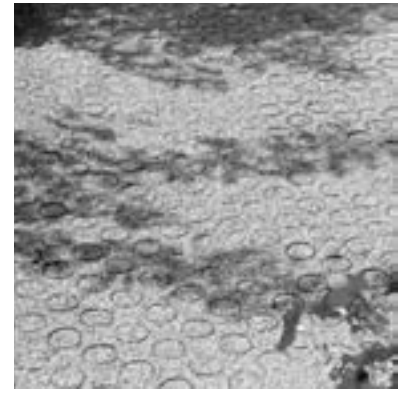
Because of the minimum area requirement, impervious surface reduction may be more cost effective than installing a flow control facility. For example, a parent lot may exceed the impervious surface coverage by only 800 square feet and will be required to install a flow control facility for that amount plus an additional 1200 square feet to meet the 2000 square foot minimum area. Rather than install a flow control facility, applicants may use porous pavement or natural flow control (see section 2.3) in select areas to drop below the coverage limitations. If a proposed development meets the Plat impervious limitations then no additional stormwater detention or water quality treatment is required. Porous pavement will not be considered an impervious or pollution-generating surface and will not be counted in water quality treatment requirements.

This section describes options to reduce impervious surface coverage to avoid the requirement of a flow control facility. Flow control requirements are further specified in the Drainage Covenant for the Plat of the High Point Community (see Appendix B).

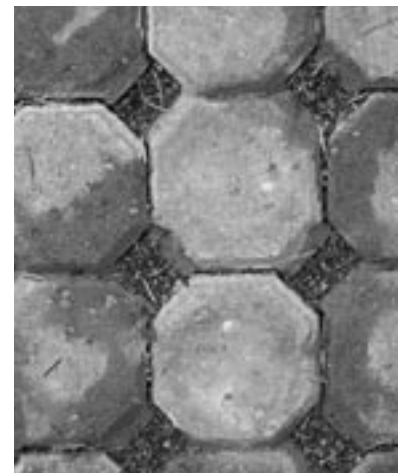
2.1 Pavement options

Porous pavement is a surface that allows water to pass through its void spaces in the material and/or between units. When stormwater encounters impervious pavement, such as asphalt or concrete, it runs off, usually into the street or a catch basin, while porous pavement allows some infiltration. The pavement options in this section are methods to reduce impervious surfaces on private property.

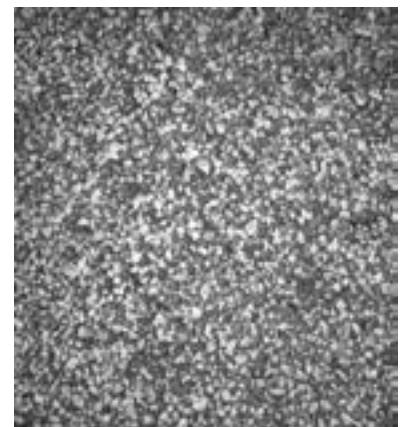
All pavement must meet the following requirements to be considered porous and to not be included in calculations of vehicular impervious surface coverage in the Permit Submittal Chart for Drainage Requirements.



water infiltrates through porous gravel mat



pavers on a porous base with sand filled joints



water passes through void spaces in porous concrete

High Point Community: Site Drainage Technical Standards

- There shall be 6 inches minimum depth of drain gravel below the surface.
- Surface material shall infiltrate stormwater at a rate of 10 inches per hour.
- The sub grade shall drain through infiltration or lateral release to a discharge point. This can be achieved using a perforated pipe, catch basin, gravel trench or NDS.
- The surface shall be sloped to provide positive drainage.
- Stormwater shall drain to a designated discharge point.
- Use of optional perforated pipe shall be reviewed by project engineer or geotechnical engineer.
- Cleanouts shall be provided when a perforated pipe is installed.

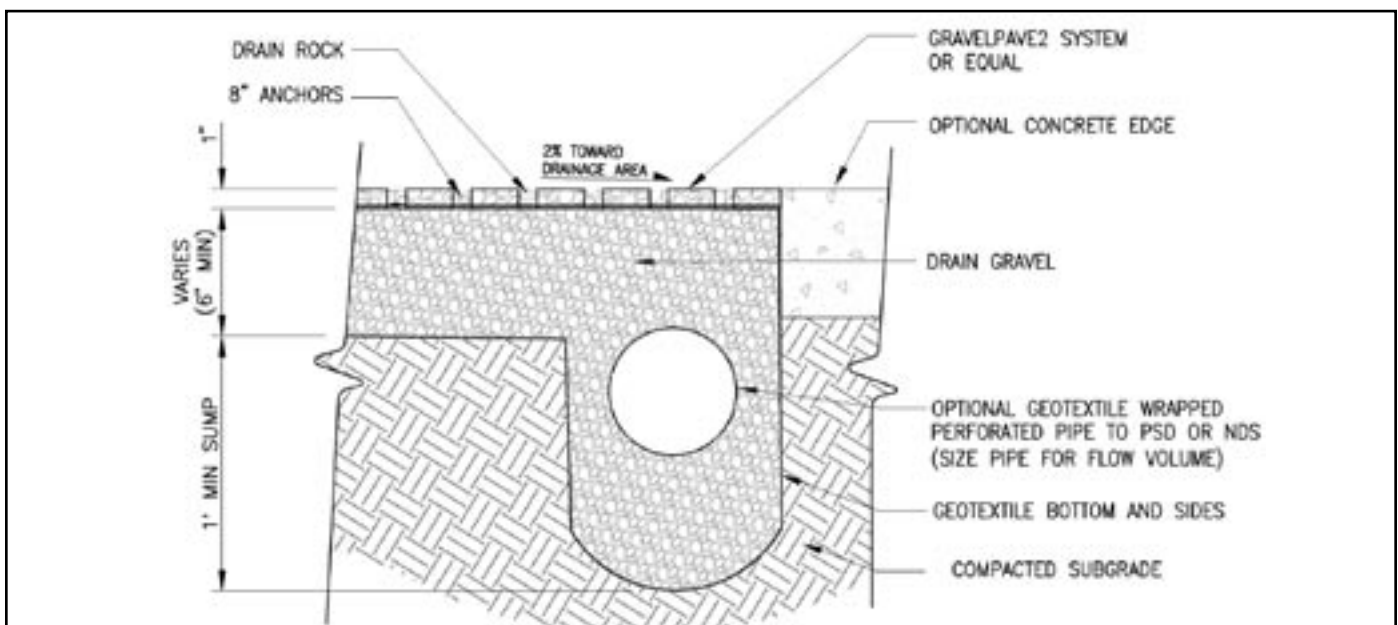
High Point Community: Site Drainage Technical Standards

The following options may be applied to a site to decrease impervious surfaces and improve infiltration of stormwater:

Option 2.1a: Porous gravel mats

Porous gravel mats are appropriate for vehicular or pedestrian traffic. The plastic material is made up of interlocking units that are filled with gravel. The units reduce the scattering and compaction of the gravel and increase its stability.

- A layer of geotextile fabric shall be placed below the mats to reduce weeds.
- Mats shall be filled with infill gravel per manufacturer's recommendations.
- Mats shall be stabilized with 8 inch anchors (or as provided by manufacturer) at 18 inch intervals (or as specified by the manufacturer) and along edges.
- If mats are to be used in vehicular areas, a 1 foot minimum concrete retainer or other accepted restraint edging shall be constructed.
- Perforated pipe may be installed and shall be connected to a PSD.
- Depth of perforated pipe shall be per manufacturer's recommendations and/or pipe shall be located outside travel area.



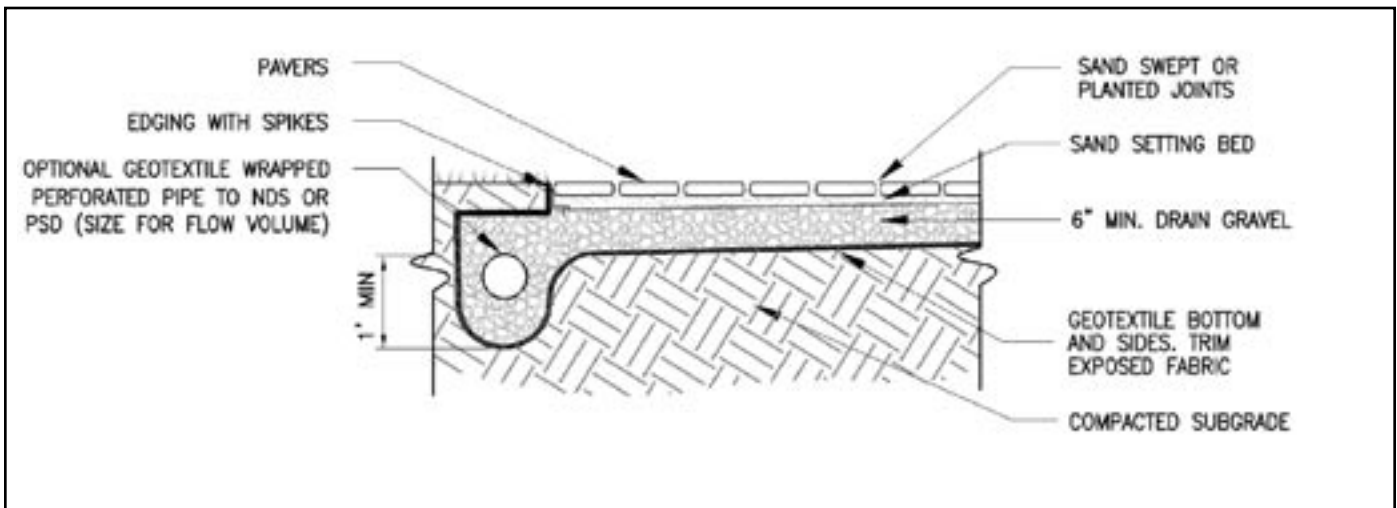
Porous gravel mat

NTS

Option 2.1b: Pavers on a porous base

Pavers on a porous base are appropriate for pedestrian or vehicular traffic. Individual paver units may be porous, such as porous concrete units, or impervious, such as flagstone, provided the void space between the units allows water to pass.

- Restraint edging shall be used to contain the pavers.
- A minimum of 10% of surface area, including joint space, shall be porous.
- Joint space shall be a minimum of ¼ inch in width.
- Joints shall be swept with sand or planted (see suggested plant list, section 8.4)
- Depth of optional perforated pipe shall be per manufacturer's recommendations and/or pipe shall be located outside travel area.



Pavers on a porous base

NTS

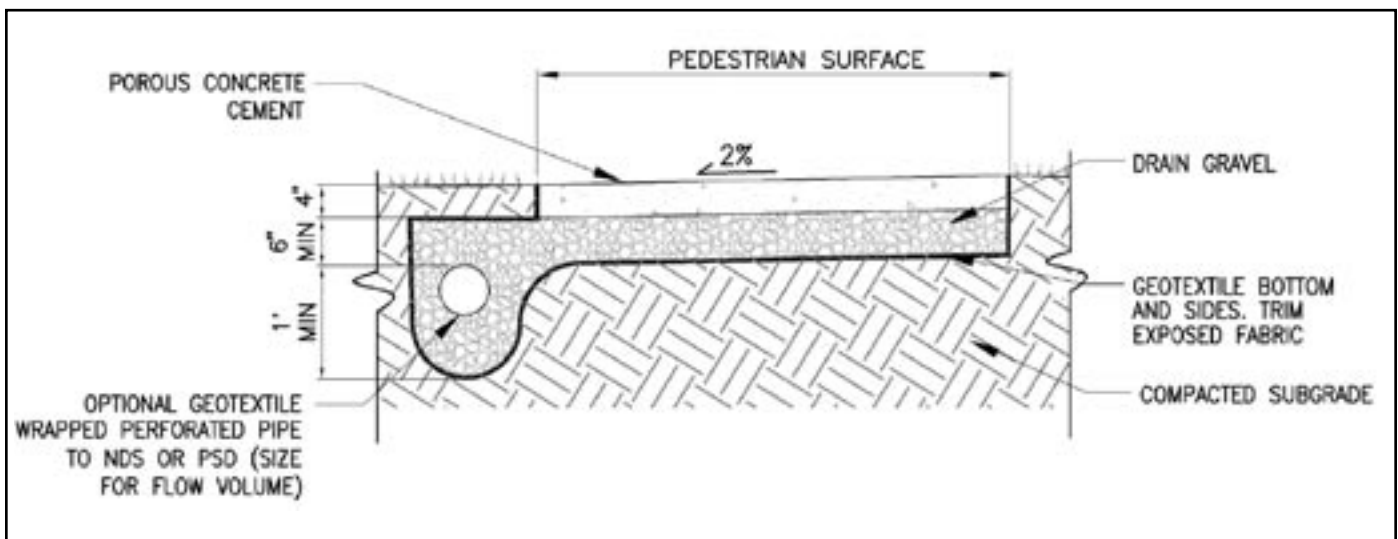
Option 2.1c: Porous asphalt

Porous asphalt is a surface that is designed to allow infiltration. This material can be used for vehicular or pedestrian areas. Suppliers may require a minimum order due to asphalt manufacturing limitations.

Option 2.1d: Porous concrete pedestrian surface

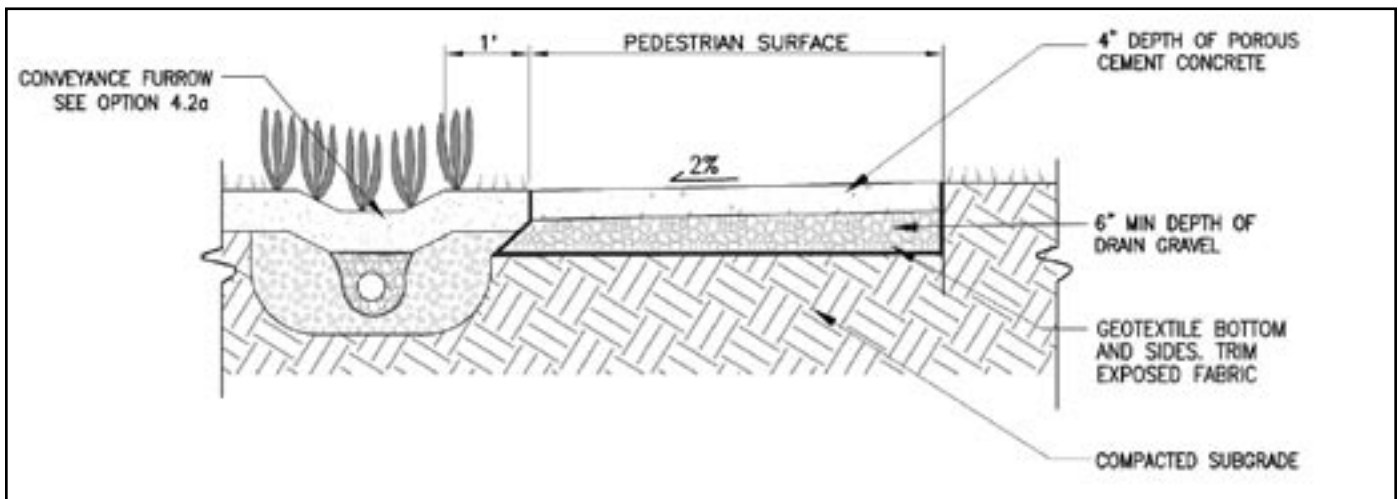
Porous concrete is a surface that is designed to allow infiltration. This material can be used for pedestrian walks and patios.

- Surface shall be sloped for drainage into a conveyance furrow, landscaped area, trench or a catch basin.
- Perforate pipe wrapped in geotextile fabric and connected to the NDS or PSD may be installed at the top of the sump.
- Depth of optional perforated pipe shall be per manufacturer's recommendations and/or pipe shall be located outside travel area.



Porous concrete pedestrian surface

NTS



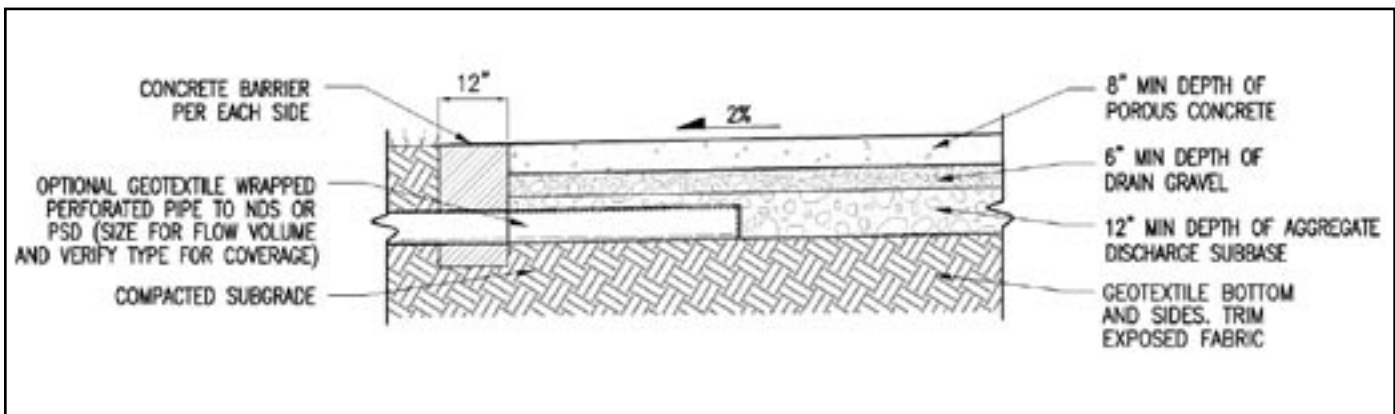
Porous concrete pedestrian surface with drainage to conveyance furrow

NTS

Option 2.1e: Porous concrete vehicular surface

Porous concrete vehicular surface is a surface that is designed to allow infiltration. This material can be used for vehicular areas such as private alleys, driveways and parking lots.

- Surface shall be sloped for drainage into a conveyance furrow, landscaped area, trench or a catch basin.
- Depth of perforated pipe per manufacturer's recommendations for vehicular surface and/or pipe shall be located outside travel area with minimum cover of 18 inches.
- Concrete barrier shall be a minimum of 12 inches.



Porous concrete vehicular surface

NTS

2.2 Driveway pavement reduction options

In the following options, the impervious surface area is reduced rather than replaced with porous material. The following options provide a larger porous surface area and increase the area available for planting.

Option 2.2a: Hollywood driveway

A Hollywood driveway is an option in which the center portion of the driveway pavement is removed. The minimum requirements are:

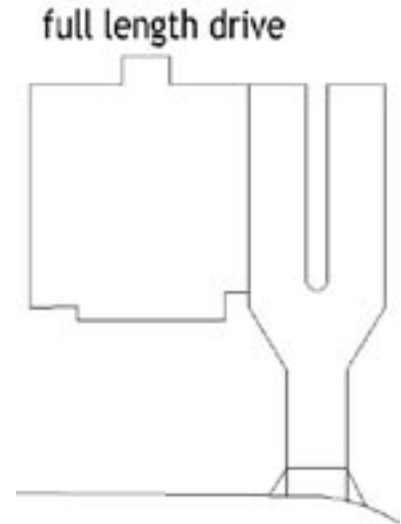
- Tracks shall be 24 inches wide, spaced 48 inches apart with a porous center strip.
- The center of the drive shall be a porous surface, such as groundcover (see suggested plant list, section 8.3), grass or drain rock.

Option 2.2b: Reduced driveway length

Reduced driveway length is the shortening of a driveway to remove unnecessary paving. It may be used in combination with a Hollywood driveway.

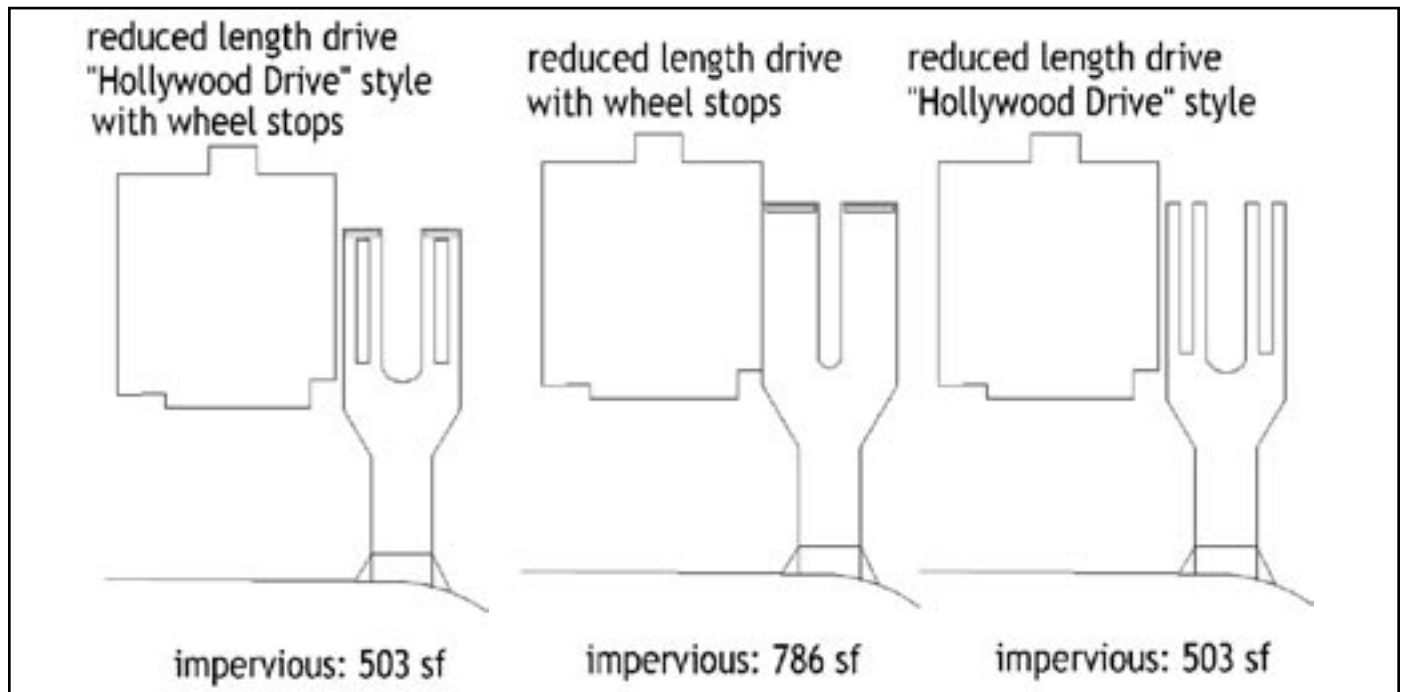
Option 2.2c: Wheel stops

Wheel stops may be used at the end of a parking strip to mark the edge of the driveway and allow for vehicle overhang. This can be used with both the above reduction strategies.



impervious: 903 sf

a typical duplex driveway



Driveway reduction

NTS

2.3 Impervious surface credit options

Parent lots with impervious surfaces less than 500 square feet over the parent lot limit as set by the Plat may reduce their impervious surface area with the addition of a simplified onsite natural flow control system. Rain gardens and stormwater planters may be constructed to detain runoff from areas that exceed the limitations³.

A stormwater planter may only be credited for impervious area reduction or downspout conveyance, not both. See section 4.2 for information on options for downspout conveyance.

Table 2.3: Impervious surface credit options sizing requirements

The following is a table of required dimensions for detention credit options. More than one planter or garden can be constructed to meet square foot requirements. For roof area drainage, see Tables 4.2f for stormwater planter sizing requirements.

Impervious Area	Stormwater planter surface area and rain garden floor area
Under 200 square feet	24 sf
200-300 square feet	36 sf
300-400 square feet	48 sf
400-500 square feet	60 sf
over 500 square feet	flow control facility required

³ See Plat of High Point Community for flow control requirements for parent lots greater than 500 sf over impervious surface limitations.

Option 2.3a: Rain gardens

A rain garden is an attractive and cost-effective method of containing and infiltrating stormwater. A rain garden is a shallow depression in the landscape that is planted with perennials, shrubs, small trees or herbaceous plants that can withstand periodic inundations of water. It may be formed to any shape in the landscape. A rain garden that meets the following criteria can be credited for impervious surface to aid in meeting impervious surface limitations. See Table 2.3 for sizing information.

- Rain gardens shall be located a minimum of 5 feet from any buildings without basements and 10 feet from buildings with basements.
- Rain garden shall be sized according to the Table 2.3.
- An infiltration test shall be performed to determine the necessity of soil replacement. Dig a hole 8 inches deep and 8 inches in diameter. Fill with water. Water should infiltrate at a rate of 1 inch per hour. If it does not, soil replacement is required.
- Soil requiring replacement shall be replaced on the floor and banks of the rain garden to a depth of 18 inches.
- Existing and replacement soil shall be uncompacted to increase infiltration.
- Replacement soil shall meet the soil requirements in section 6.4.



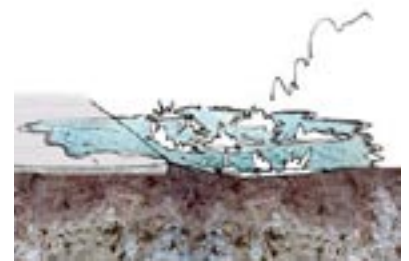
Rain gardens can be planted and shaped to fit the character of individual residences.

Meets Requirements



water infiltrates into uncompacted soils

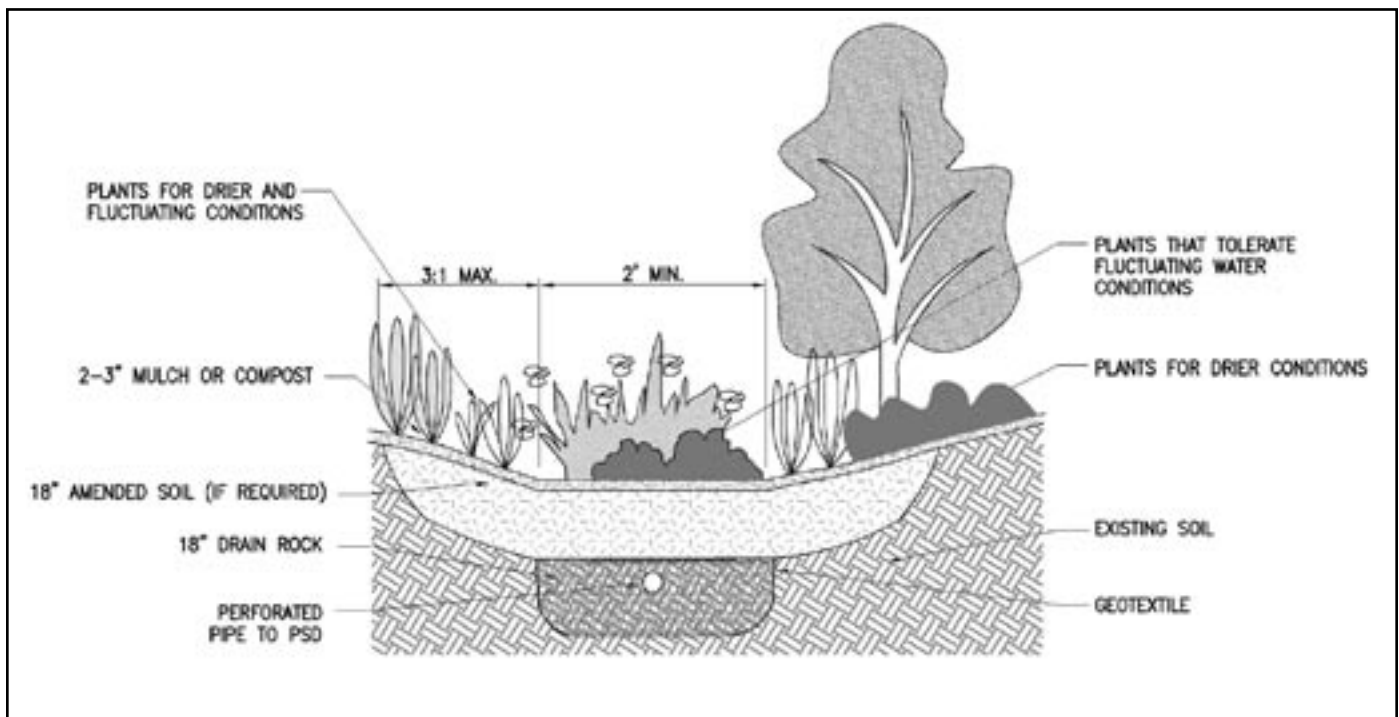
Not Allowed



water cannot seep into the compacted ground

High Point Community: Site Drainage Technical Standards

- Soil not requiring replacement shall be amended with 3 inches of compost rototilled 6 to 8 inches deep.
- Surfaces draining to rain garden shall be sloped at 1 to 20% to promote positive drainage.
- Bottom of rain garden shall be flat to ensure infiltration of the entire surface area.
- Perforated pipe shall have a 1 foot minimum sump.
- Overflow shall flow overland or be piped to a designated discharge point.
- Water shall infiltrate completely within 24 hours after a 25-year rain event.
- Water depth shall be a maximum of 6 inches, from bottom to overflow elevation.
- Rain garden shall be planted with vegetation (see suggested plant list, section 8.1 and 8.2)



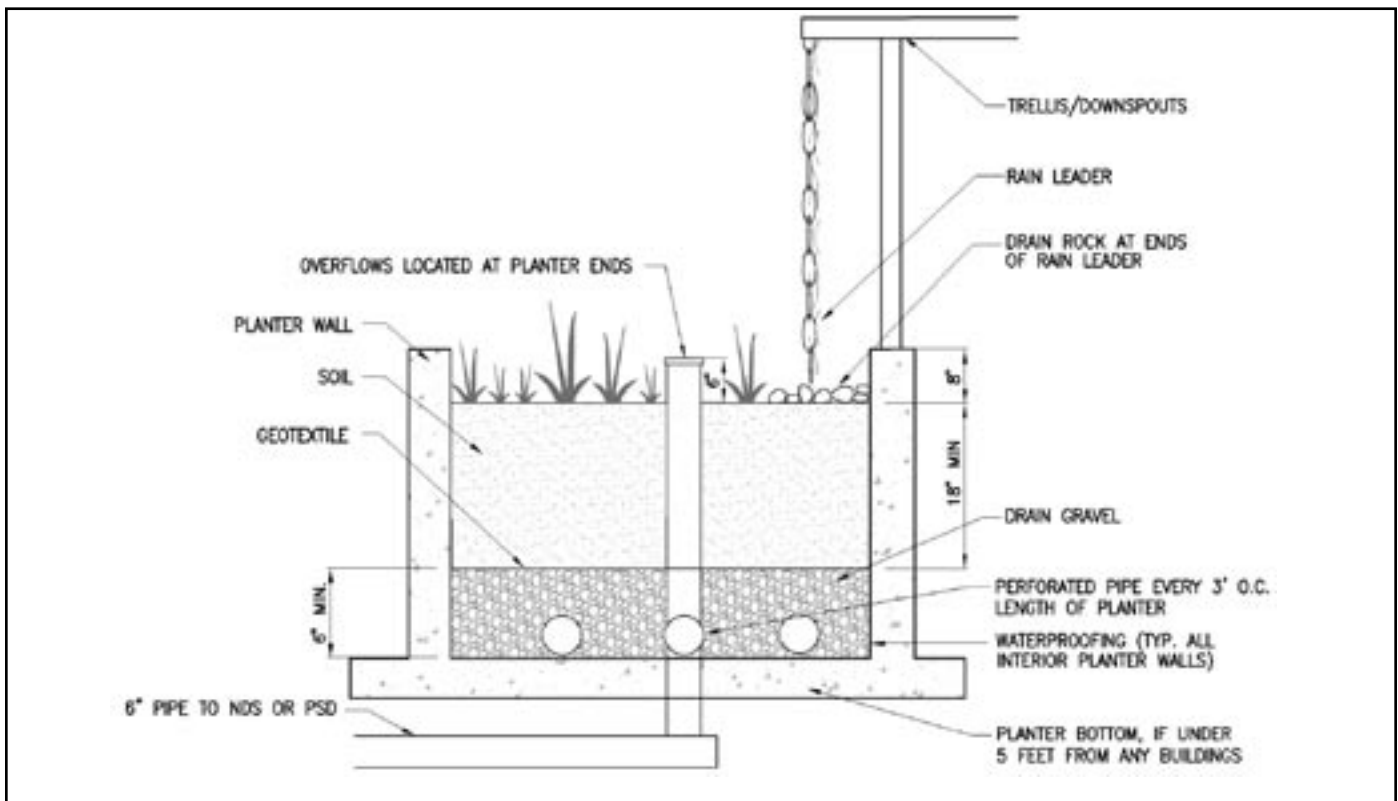
Rain garden

NTS

Option 2.3b: Stormwater planter

A stormwater planter is a structure that can detain and convey runoff from impervious surfaces. It is most appropriate for roof runoff and smaller spaces or adjacent to a building or hardscape because water can be prevented from seeping into surrounding soil.

- Interior dimensions of planter shall be a minimum of 2 feet wide, 8 feet long.
- Planter walls shall be a durable material such as concrete.
- Planter bottom is optional to allow infiltration if it is located at least 5 feet from any buildings.
- Interior walls and bottom of planter shall be lined with waterproofing if planter is located less than 5 feet from any buildings.
- Soil shall meet requirements in section 6.4.
- Perforated pipe shall connect to a discharge pipe that conveys water to an NDS or a PSD.
- Overflow pipes shall be installed at planter ends.

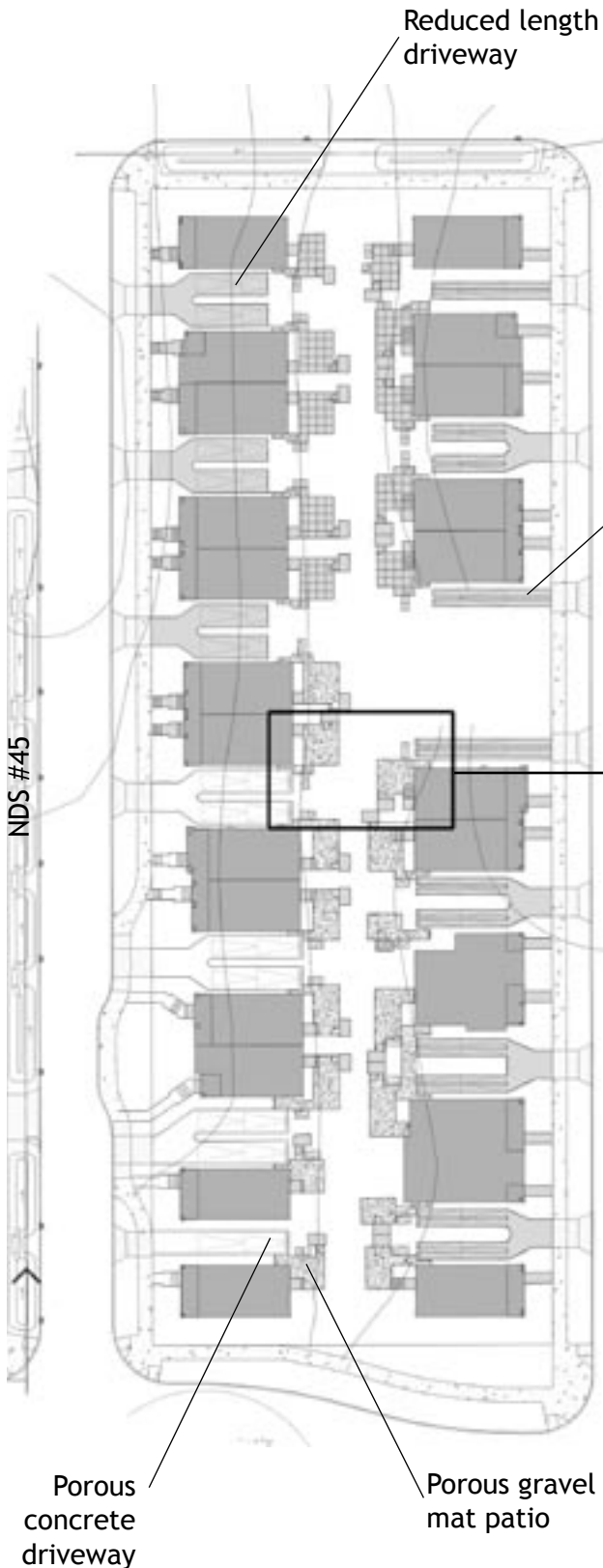


Stormwater planter

NTS

2.3 Sample applications

This is a hypothetical block plan at High Point. The block is designed for 25 single-family units. The calculations in the following sample Permit Submittal Chart demonstrate how the block plan exceeds the impervious area allowed according to Sheet 23b of the Plat (see Appendix A for blank Permit Submittal Chart). The drawings on this page are examples of strategies that can reduce impervious area.



Impervious surface coverage

This example shows the use of a porous gravel mat for patios and porous pavement for the driveways as strategies to reduce the impervious surface area.

High Point Community: Site Drainage Technical Standards

Plat of High Point Community Permit Submittal Chart for Drainage Requirements **Undeveloped Lot**

Block Number	3
Parent Lot Number	45

Discharge Point and Method of Connection for Roof Downspouts

(A) Designated Discharge Point(s) (from Plat)	
Site drains to the discharge point at 1% slope or greater? (If no, drainage may be piped to PSD (per Section 3 of Site Drainage Technical Standards and Paragraph B on Sheet 23b of the Plat))	
(B) Total Roof Area (sf)	
(C) Allowable Percentage of Roof Area that may be Piped to the Discharge Point (% from plat)	<i>refer to section 4.4</i>
(D) Proposed Percentage of Roof Area to be Piped to the Discharge Point (%) (round to nearest 5%)	<i>for a sample Permit Submittal Chart of "discharge option and method of connection for roof downspouts"</i>
(E) Selected downspout option(s) (choose from options in Technical Standards Manual)	
(F) Selected conveyance option(s) (choose from options in Technical Standards Manual)	
(G) Selected transition to ROW option(s) (choose from options in Technical Standards Manual)	

Flow Control

(1) Parent Lot Area (sf)	17,700 sf
(2) Allowable Impervious Surface Coverage (% from plat)	60%
(3) Allowable Square Footage of Impervious Surface Coverage (sf) $[(1) \times (2)]$	10,620 sf
(4) Total Proposed Roof Area on Parent Lot (sf)	6,050 sf
(5) Proposed Impervious Vehicular Surface Coverage (sf)	3,560 sf
(6) Proposed Other Impervious Surface Coverage on Parent Lot (sf)	2,070 sf
(7) Total Proposed Impervious Coverage Area (sf) $[(4) + (5) + (6)]$	11,680 sf
(8) Total Percent Impervious Coverage Area (% of Parent Lot Area) $[(7) / (1)]$	66%
Flow Control Required? (Flow Control is required if (8) exceeds (2))	yes
(If Flow Control is Required) Total Impervious Area Requiring Flow Control $[(6) - (3)]$, minimum 2000sf]	2000 sf
(If Flow Control is Required) If impervious area is less than 500 sf, selected detention option(s) (choose from options in Technical Standards Manual).	
Is water quality required? (Answer "yes" if proposed impervious surface is at least 500 sf over that allowed and vehicular impervious surface is over 5000 sf).	NO

* Detention and water quality treatment for all development within the High Point Community will be reviewed based on the requirements within the Site Drainage Technical Standards rather than the Stormwater Code sections on detention and water quality.

* Data in column shall be specific to each parent lot. Add columns if application includes more than one parent lot.

Checklist

- ☐ Complete Permit Submittal Chart for Drainage Requirements for Undeveloped Lot.
- ☐ Provide site plan with existing and proposed impervious surfaces, buildings and roof outlines.
- ☐ Provide grading plan with existing and proposed contours.
- ☐ Indicate proposed roof area to be piped. Hatch or shade on plan.
- ☐ Indicate proposed connection location and type from piped downspouts to designated discharge point on plan.
- ☐ Indicate proposed location and type of conveyance from remaining downspouts to designated discharge point on plan.
- ☐ Indicate proposed locations and transition options where runoff crosses sidewalk or vehicular area on plan.
- ☐ Indicate non-piped downspouts serving over 1750 sf of roof area and provide calculations for conveyance and transition to ROW from a professional civil engineer.

3 DRAINAGE DISCHARGE POINTS

Most properties in High Point Community may drain to the NDS located in the Right of Way (ROW). Some properties tie directly to the Public Storm Drain (PSD). To view the requirements for a specific property see Appendix B for a copy of Sheet 23b of the Plat of High Point Community.

Runoff from a parent lot discharges to one or more NDS as designated by the Plat. In some cases both a PSD and an NDS are designated. If this occurs, drainage is required to be discharged to the NDS; however, if surface or piped flow to an NDS is not possible, drainage may be permitted to directly connect to the PSD.⁴

All drainage discharge shall use the following criteria to meet the discharge requirements:

- Roof runoff shall flow to a conveyance zone, such as a conveyance garden or conveyance furrow, and subsequently to an NDS.
- Runoff may be piped to an NDS where site grades are not sloped away from buildings.
- When the slope of the ground is too flat to convey water to the NDS via surface flow or a pipe, water may be piped directly from the downspout to the PSD.
- An overflow catch basin(s) may be installed, if necessary, to convey larger storm flows to the PSD.

Site drainage discharge shall flow towards the designated discharge points as stated in Sheet 23b of the Plat, with the following exceptions:

- A maximum of 1000 sf of private vehicular area per access drive may sheet flow across a sidewalk to the ROW. This includes alleys and driveways.
- Site drainage for accessible units may be piped directly to the PSD.
- Where footing depth causes the site storm system to be too deep to daylight, discharge to the PSD is allowed. Surface drainage shall still sheet flow where feasible.

⁴ See Sheet 23b of the plat to determine when connection to the PSD is permitted.

4 ROOF AREA DRAINAGE LIMITS

On most properties, at least a portion of the roof area drainage is required to be discharged over the ground's surface. Some properties may need to pipe the roof drainage directly to the designated discharge point. The table on Sheet 23b of the Plat shows the direct connections allowed per parent lot (see Appendix B). Each parent lot is allowed a certain percentage of the roof area drainage to be piped to the discharge point. The allowances are based on site grades and other factors.

When 100% of the roof area is allowed to be piped, the discharge requirements do not apply. The piped downspouts may connect directly to the designated NDS or PSD.

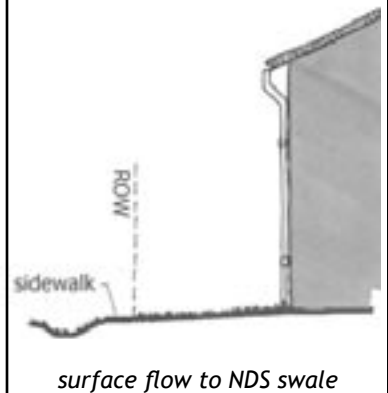
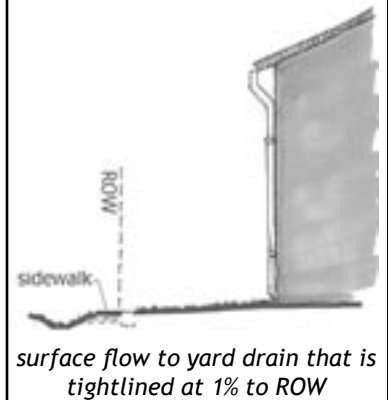
On parent lots where less than 100% of the roof area drainage may be piped, a percentage of the drainage must be discharged over the ground's surface. The discharge from these downspouts must surface flow a minimum of 8 feet across a porous surface before entering a designated discharge point.

The following criteria must be addressed to meet the discharge requirements:

- The ground shall have a minimum of 1% positive slope away from building foundations.
- An impervious surface or splash block sloped away from the building shall be installed at the base of each downspout.
- Water shall not flow or puddle adjacent to a building.
- Water shall flow for a minimum of 8 feet on private property on a porous surface prior to reaching the ROW.
- Erosion reduction strategies, such as a graded conveyance furrow (see section 4.2c), shall be provided for slopes of more than 4(H):1(V) (25%).
- If runoff flows across a sidewalk, alley or ROW, it shall sheet flow and be spread at least two feet wide to avoid concentrated flows. Slopes of 8% or greater shall have a level spreader installed (see section 4.3).

The options in the following pages may be used to meet the Plat requirements for parent lots that are not allowed to pipe all the roof area drainage.

Surface conveyed



Piped

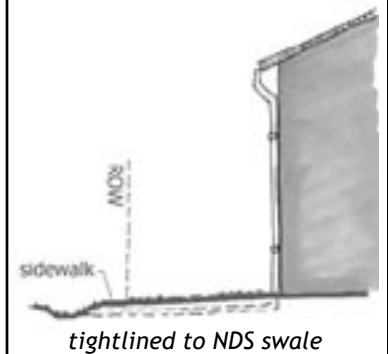
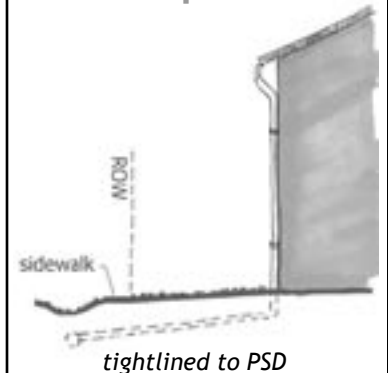
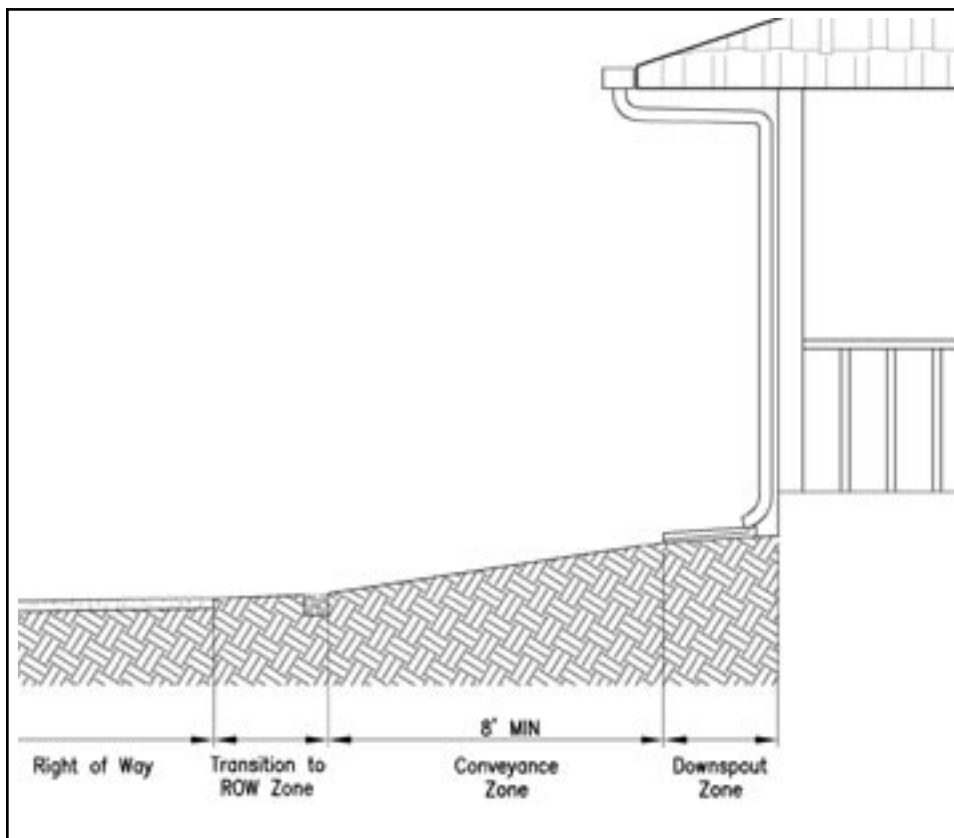


Table 4: Options for surface discharge of roof drainage

Roof area per downspout		Downspout zone				Conveyance zone							Transition to ROW zone		
		Splash block	Rain barrels	Daylighting piped flow	Pop-up drainage emitter	Conveyance furrow	Terraced conveyance furrow	Contoured land	Common yard conveyance swale	Conveyance garden	Stormwater planter	Dispersal trench	Gravel level spreader	Plank level spreader	Yard drain
Under 500 sf															
slope	less than 1% positive slope		X	X	X					X	X	X			
	1-25% positive slope	X	X	X		X		X			X	X			
	25%+ positive slope	X	X			X		X			X	X	X	X	X
500-1000 sf															
slope	less than 1% positive slope		X	X	X					X	X	X			
	1-25% positive slope	X	X			X		X	X	X	X	X	X	X	X
	25%+ positive slope	X	X				X				X	X	X	X	X
1000-1750 sf															
slope	less than 1% positive slope		X	X	X					X	X	X			
	1-25% positive slope	X	X			X		X	X	X	X	X	X	X	X
	25%+ positive slope	X	X				X				X	X	X	X	X
Over 1750 sf															
slope	less than 1% positive slope		X	X	X					X	X	X			
	1-25% positive slope	X	X			X		X	X	X	X	X	X	X	X
	25%+ positive slope	X	X				X				X	X	X	X	X

Roof area drainage discharge can be broken down into three zones:

- Downspout zone: Roof area drainage exiting the downspout must be slowed to reduce erosion and allow water to flow to a conveyance zone.
- Conveyance zone: Roof area drainage is conveyed or infiltrated before it reaches the transition to ROW zone.
- Transition to ROW zone: Roof area drainage is spread in the transition from the conveyance zone to the ROW to prevent concentration of flows from entering the ROW. Drainage is directed from the transition to ROW zone to the designated discharge point.

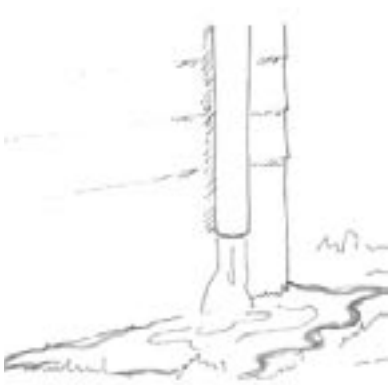


Depending on the site grades and volume of water, options from one or more zones shall be required. See Table 4 and individual options for more information.

A variety of options from each zone are described in the following pages. Because individual site conditions vary, not all options are appropriate for every situation. Consider site factors carefully before selecting an option. If none of the options are appropriate, alternatives that are stamped by a professional civil engineer may be submitted to DPD for review. Applicants assume liability for any plans used and use of this manual.



Meets requirements



Not Allowed



Not Allowed

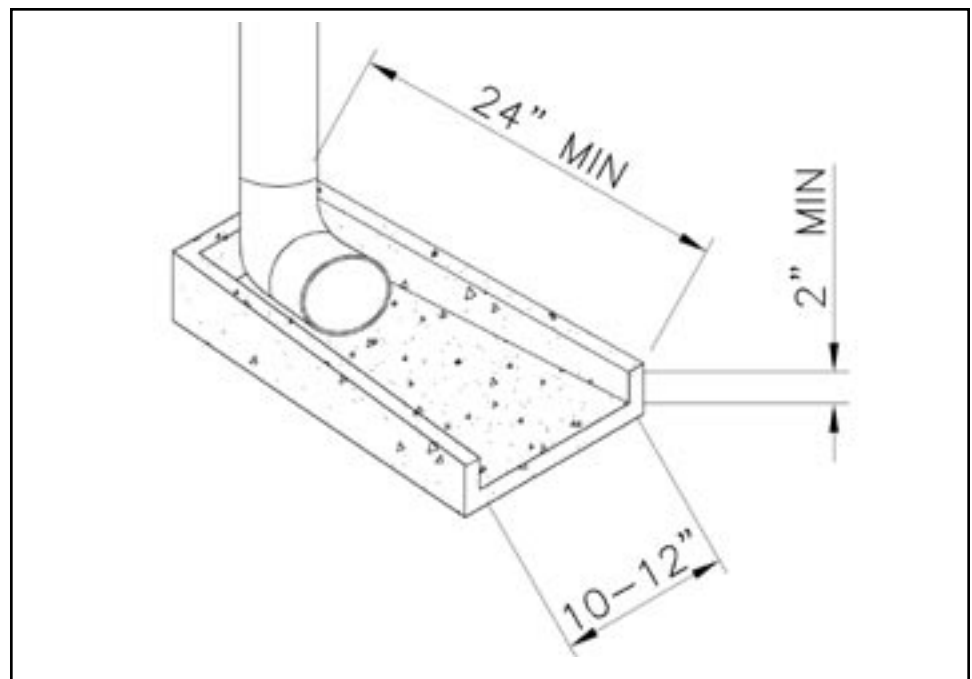
4.1 Downspout zone options

Options 4.1a through 4.1d are to be used at the base of a downspout. They may be used individually or in conjunction with one another, depending on the site conditions and desired aesthetic. These features can aid in meeting the plat requirements as well as providing opportunities for diversity and interest in individual residences.

Option 4.1a: Splash blocks

Splash blocks reduce the velocity and impact of water falling from a downspout and direct water to a conveyance furrow or other conveyance zone option (see section 4.2). They may be concrete, stone, glass or other durable product.

- Splash blocks shall be at least 24 inches long, 2 inches deep and 10-12 inches wide where they meet the conveyance zone.
- They shall weigh at least 10 pounds.
- Ground underneath downspout shall be sufficiently compacted to avoid splash block settling into the earth.
- Splash blocks shall be securely placed directly beneath the downspout.
- Splash blocks shall slope at no more than 8%.



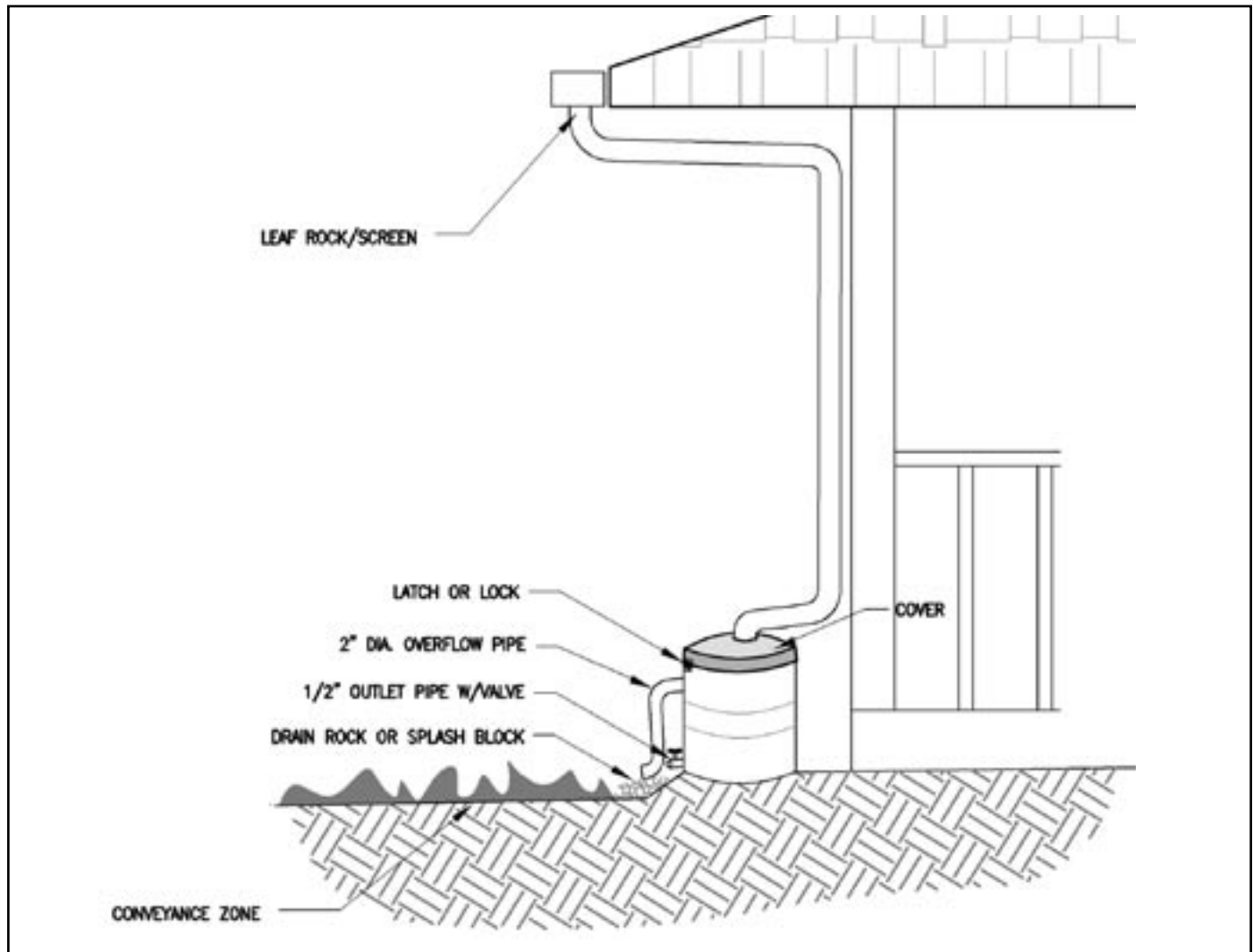
Splash block

NTS

Option 4.1b: Rain barrels

Rain barrels are connected directly to downspouts to collect water for future release or irrigation. The size of the rain barrels depends on the space available as well as the desired volume of storage. The suggested minimum is 50 gallons, however, if the water is being held for irrigation in the garden, more storage capacity is recommended.

- Downspout shall be piped directly to rain barrel with cover to avoid insect collection and debris settlement into water.
- Rain barrel shall have an overflow outlet 3 inches below top of barrel.
- Drain rock or a splash block shall be placed at the splash zone of the outlet or the outlet shall be piped to a conveyance zone.
- Overflow shall flow to a conveyance zone (see section 4.2).



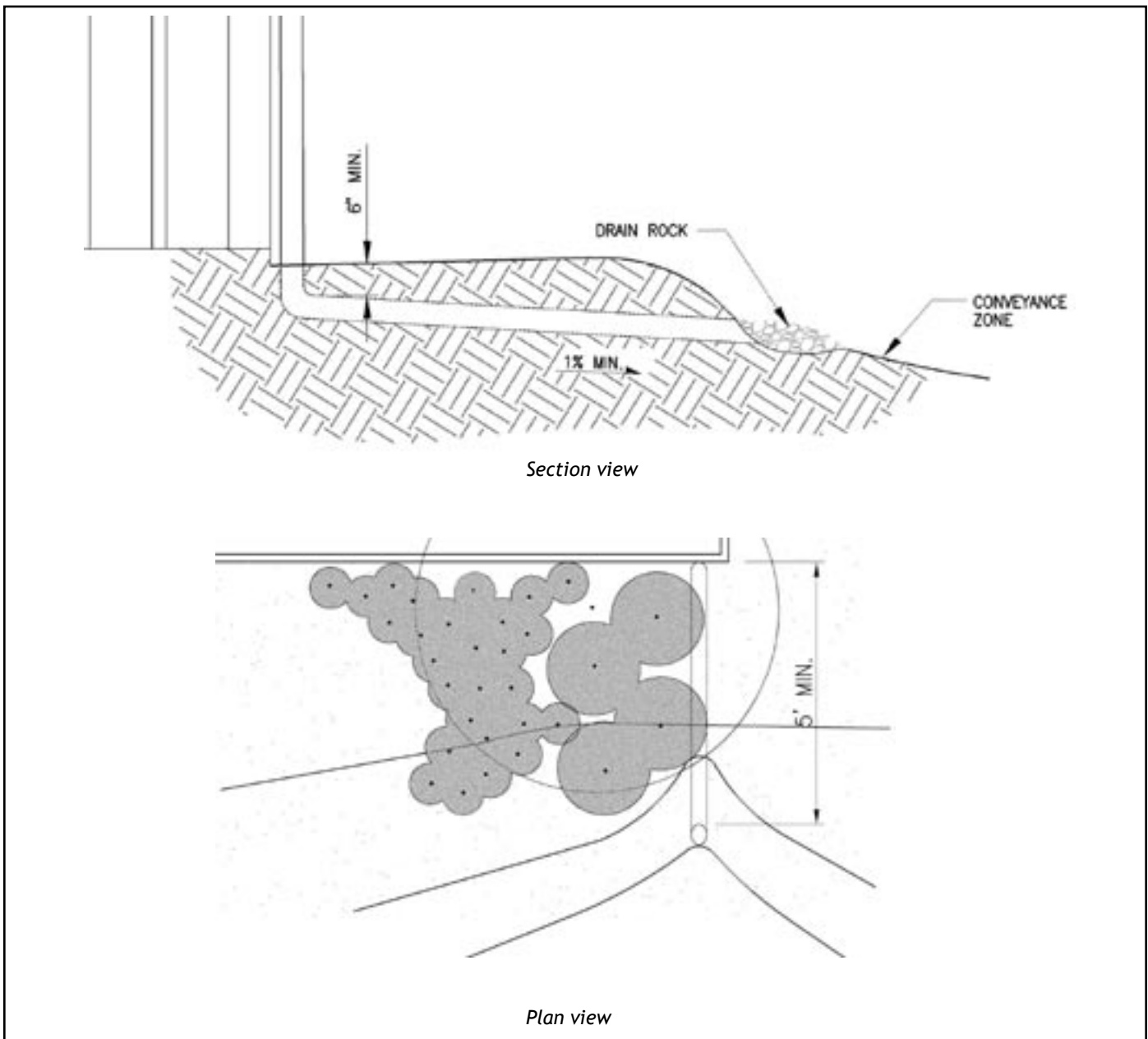
Rain barrel connected to downspout

NTS

Option 4.1c: Daylighting piped flow

Daylighting piped flow is appropriate when it is not possible to convey water directly from the downspout due to grading, paving or other site constraints. Roof runoff is piped to an area where it can be daylighted and can flow along the surface for the required 8 feet before meeting the ROW.

- Pipe shall be at least 6 inches below the surface.
- Pipe shall be daylighted to a conveyance area.



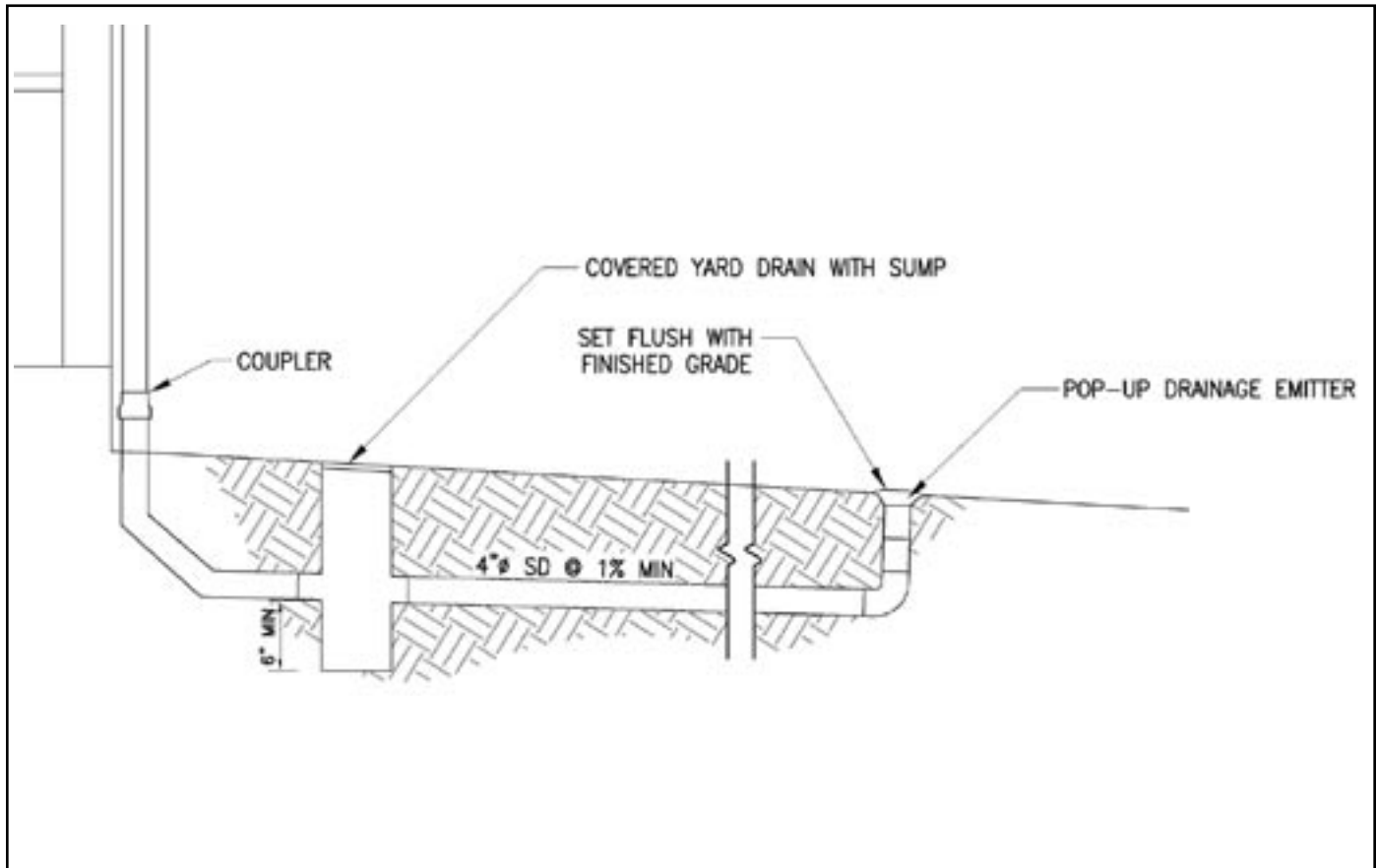
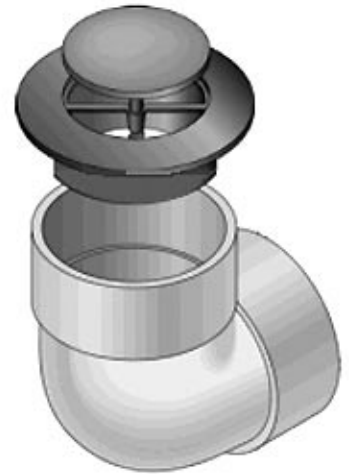
Daylighting piped flow

NTS

Option 4.1d: Pop-up drainage emitter

Similar to daylighting piped flow, a pop-up drainage emitter is appropriate when it is not possible to convey water directly from the downspout due to grading, paving or other site constraints. Roof runoff is piped to a conveyance area and is released through a capped device that opens with water pressure.

- Pipe shall be at least 6 inches below the surface.
- Pipe shall be a minimum of 4" in diameter.
- Emitter elevation shall be lower than the finished grade elevation of the base of the downspout and the yard drain.
- Yard drain shall have a minimum sump depth of 1 foot.



Pop-up drainage emitter

NTS

4.2 Conveyance zone options

One of the following options (4.2a through 4.2g) must be used in conjunction with a splash block, rain barrel or daylighting piped flow for each downspout. For slopes 4(H):1(V) or steeper, options are limited to terraced conveyance furrows. If possible, conveyance furrows can meander to reduce the slope to less than 4:1, increasing the options available. The options provided convey runoff from the downspout zone to the transition to ROW zone. Conveyance options are intended to slow stormwater.

Option 4.2a: Conveyance furrow

A conveyance furrow is a linear or gradually meandering depression that conveys water from the downspout zone to the transition to ROW zone. Conveyance furrows can vary in form, from meandering, irregular and vegetated to straight and grass-lined, and can be graded and planted to reflect the individual identity of the residences. There may be stormwater infiltration and filtering depending on the soil quality, shape and length of the conveyance furrow, however, its primary purpose is to slow and convey runoff.

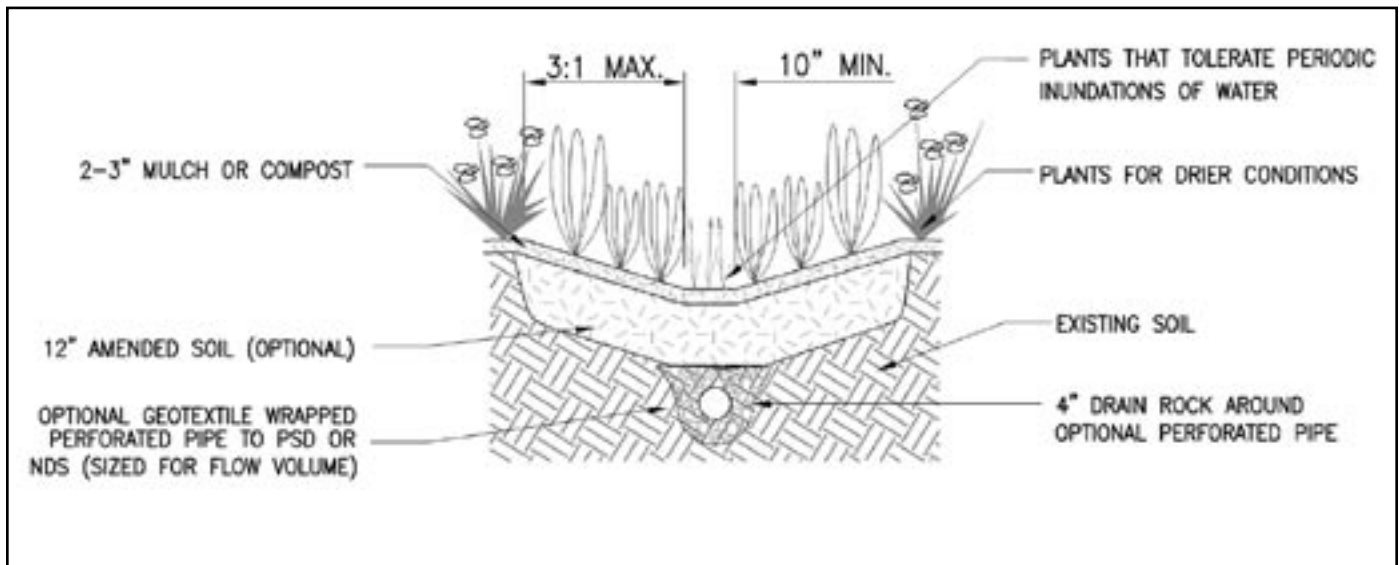


River rock can be used to reduce water velocity on slopes.

High Point Community: Site Drainage Technical Standards

Conveyance furrows shall meet the following minimum requirements:

- Sides shall have a slope of no more than 3(H):1(V).
- Conveyance furrow depth shall be sized according to Table 4.2a.
- It shall slope at least 1% longitudinally toward a transition to ROW zone (see section 4.3).
- The soil may be uncompacted and amended (see section 6.4).
- Vegetated conveyance furrows are recommended, though grass or drain rock conveyance furrows are acceptable.
- Vegetated conveyance furrows shall be planted with a variety of grasses, annuals, perennials or woody herbaceous plants (see suggested plant list, section 8.1 and 8.2).
- A conveyance furrow 4(H):1(V) (25%) or steeper requires velocity reduction measures (see terraced conveyance furrow, option 4.2c).



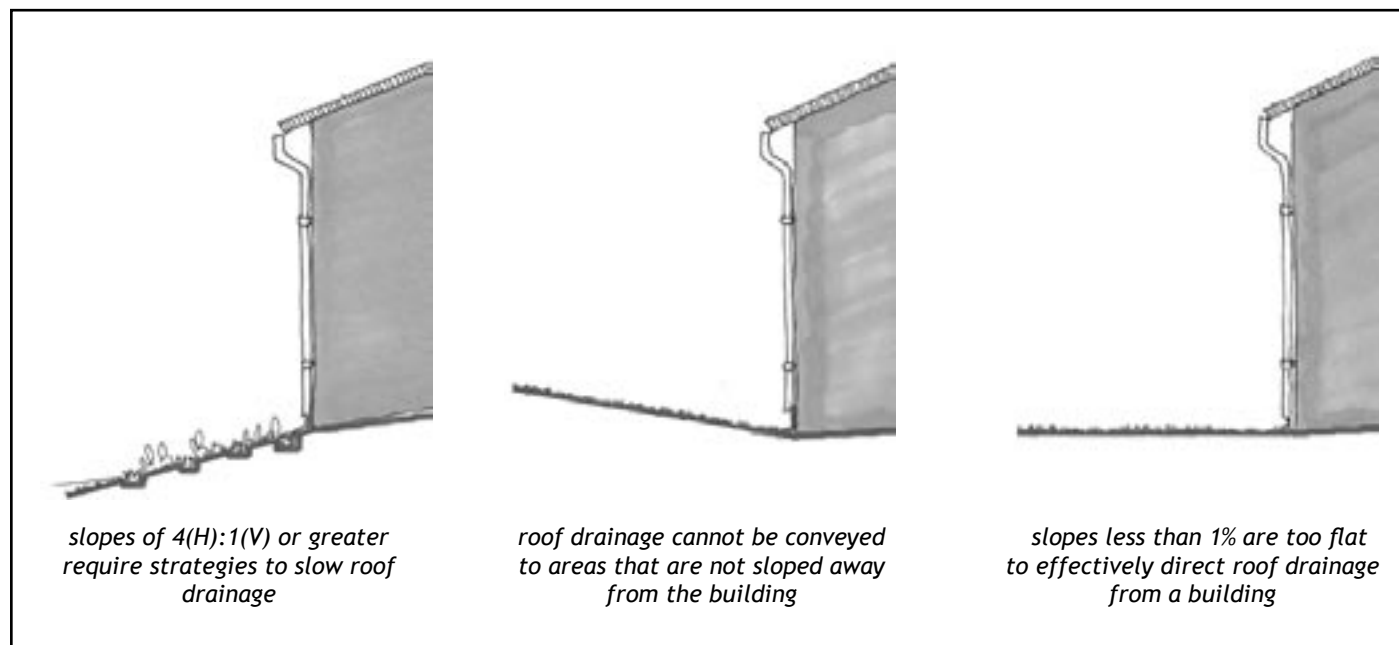
Conveyance furrow

NTS

Table 4.2a: Conveyance furrow depth

These minimum dimensions are required for conveyance furrow construction.

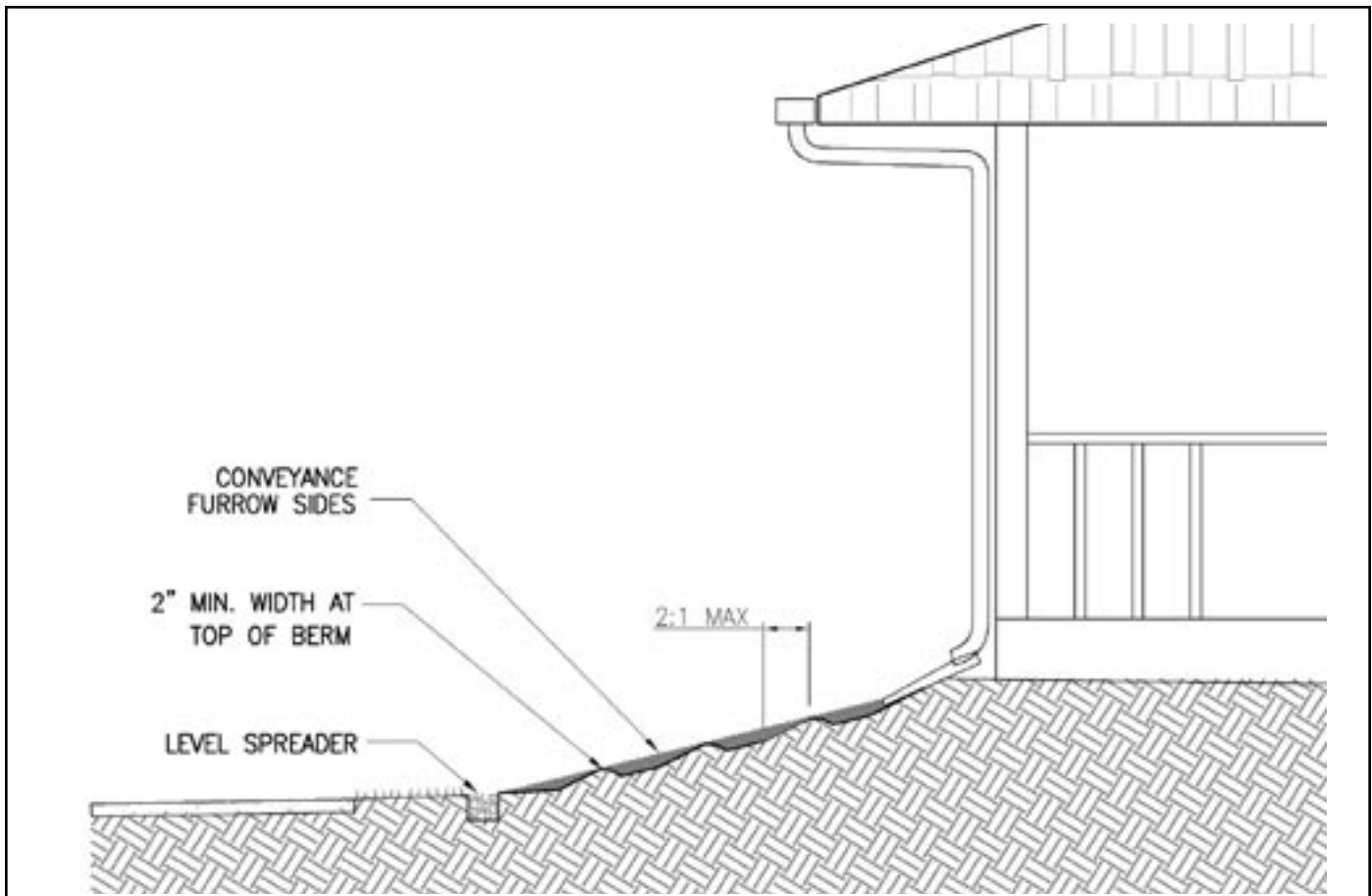
Roof Area	less than 1% positive slope	1-8% positive slope	8-25% positive slope	25%+ positive slope
Under 500 square feet	not required	not required	not required	not required
500-1000 square feet	pipelined flow required	3"	3"	3" with velocity reduction (see section 4.2c)
1000-1750 square feet	pipelined flow required	4"	4"	4" with velocity reduction (see section 4.2c)
Over 1750 square feet	pipelined flow required	engineer calcs required (see Appendix C)	engineer calcs required (see Appendix C)	engineer calcs required (see Appendix C)



Option 4.2b: Terraced conveyance furrow

Terraced conveyance furrows are appropriate for slopes of 4(H):1(V) (25%) or more. Terraced conveyance furrows act as a series of cells and berms that slow the velocity of water by allowing water to pool. In addition to meeting the requirements for a conveyance furrow, a terraced conveyance furrow shall include the following.

- Berms shall be earth or drain rock (similar to a gravel check dam).
- One berm shall be provided for every 6 inches of drop in elevation.
- Berm slopes shall be a maximum of 2:1.
- Berm height shall be at or below conveyance furrow sides.
- Conveyance furrow shall be sized according to Table 4.2a.
- Earth berms and cells shall be vegetated.
- Vegetated furrows shall be lined with an erosion control mat to minimize erosion until plants are established.



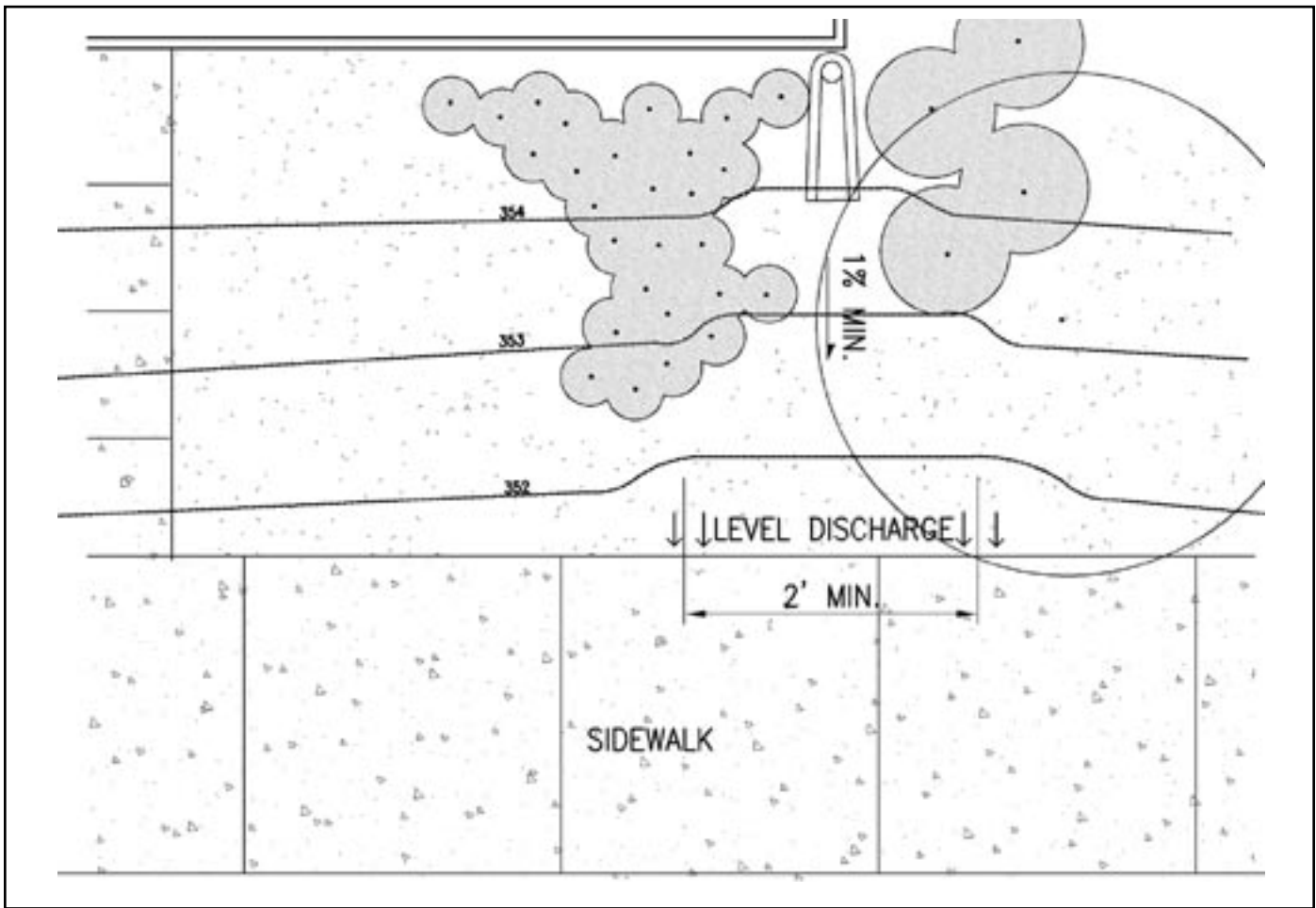
Terraced conveyance furrow

NTS

Option 4.2c: Contoured land

The land surrounding the downspout can be contoured to spread and convey stormwater. Rather than a linear conveyance furrow, water is spread through a larger area.

- Ground shall slope at least 1% toward the designated discharge point.
- Soil shall be amended (see section 6.4).
- Water shall sheet flow at a minimum of 2 feet wide.
- Ground shall be planted with grass and/or vegetation (see recommended plant list section 8.1).
- Area surrounding contoured land shall be a minimum of 2 inches above the conveyance area.
- Conveyance area shall follow site and ROW contours to provide positive sheet flow.



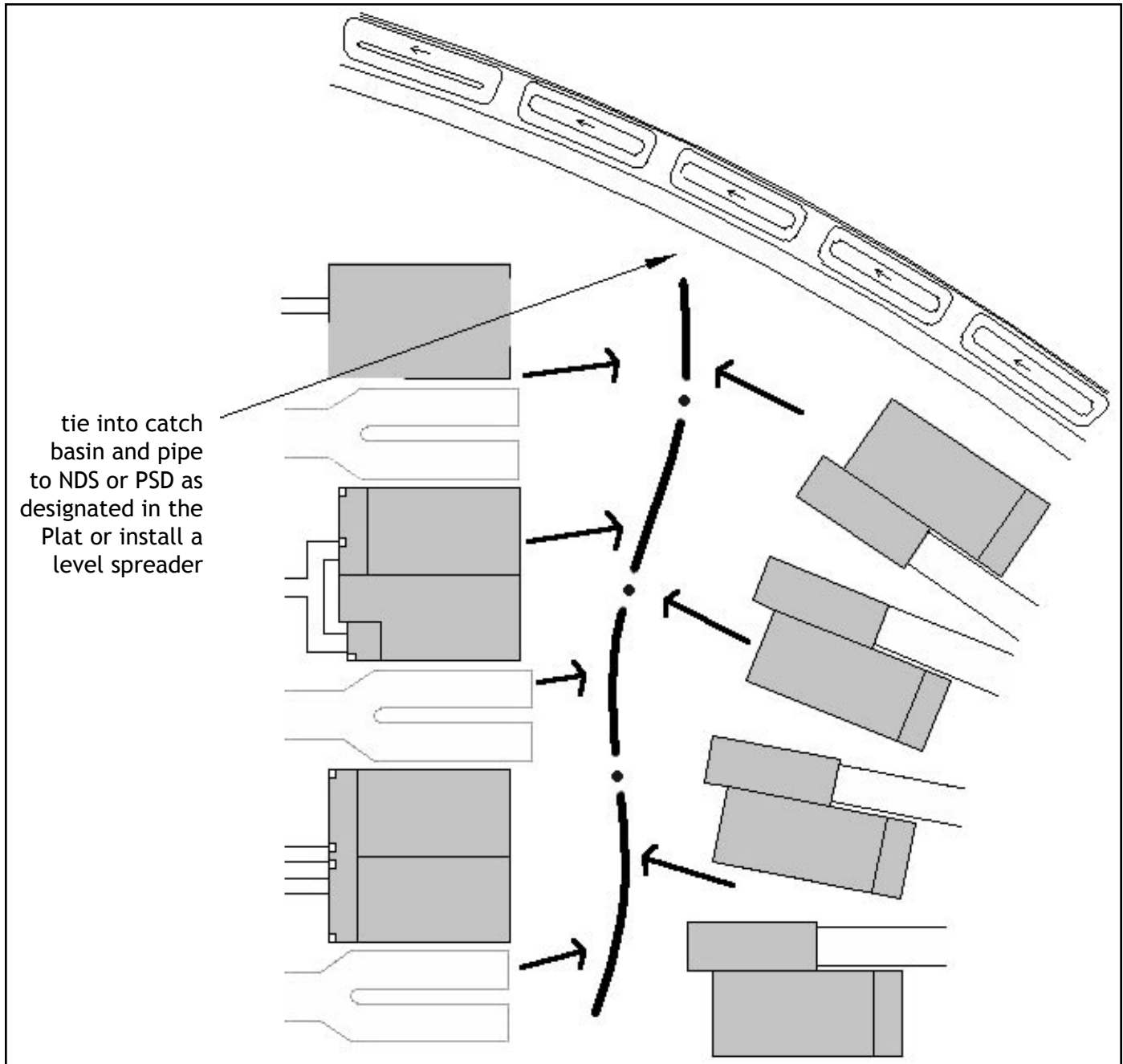
Contoured land plan view

NTS

Option 4.2d: Common yard conveyance swale

A common yard conveyance swale provides conveyance for a larger site area, often a large portion of a block. If a conveyance swale spans property lines, an easement may be required. A common yard conveyance swale must be sized by a professional civil engineer.

- Drainage may be piped to a designated discharge point or a level spreader, sized by a professional civil engineer at a minimum of 50 feet.



Common yard conveyance swale

NTS



a sculptural element is added to this conveyance garden

Option 4.2e: Conveyance garden

A conveyance garden is a small depression in the landscape that collects and filters roof area drainage and then pipes it to an NDS or PSD. It can be planted to meet the aesthetic and practical needs of a residence.

- Conveyance garden shall be located a minimum of 5 feet away from any buildings.
- Conveyance garden shall be sized according to Table 4.2e.
- An infiltration test shall be performed to determine the necessity of soil replacement. Dig a hole 8 inches deep and 8 inches in diameter. Fill with water. Water should infiltrate at a rate of 1 inch per hour. If it does not, soil replacement is required.
- Soil requiring replacement shall be replaced on the floor and banks of the conveyance garden to a depth of 18 inches.

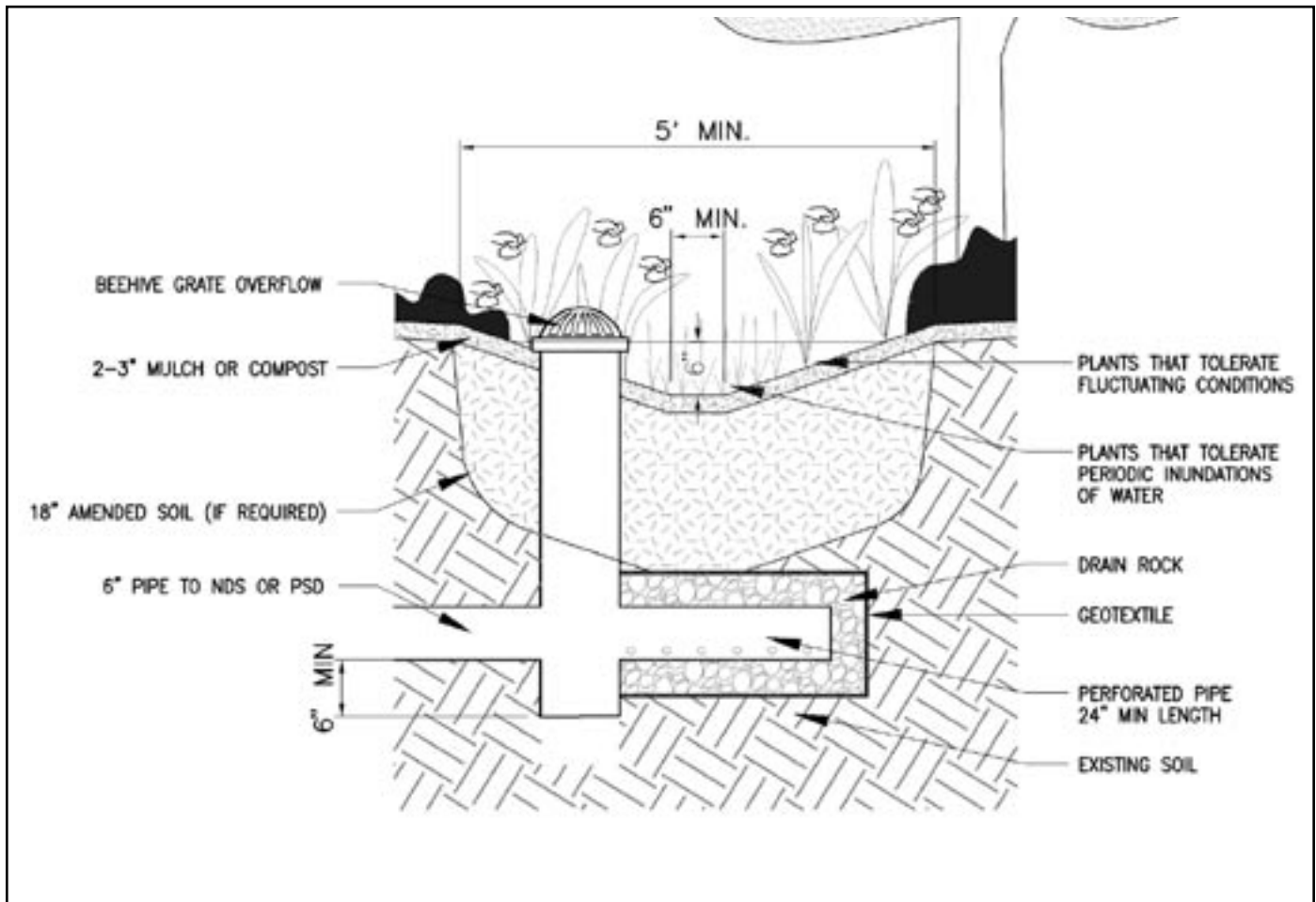
Table 4.2e: Conveyance garden dimensions

Conveyance garden area is based on a 6 inch wide flat floor with a 8 inch minimum depth and side slopes of 3(H):1(V). These minimum dimensions are required for conveyance garden construction. If desired sizing or design differs from the requirements in this section, preferred drawings and calculations stamped by a professional civil engineer shall be submitted to DPD for review.

Roof area per downspout	Conveyance garden surface area
Under 500 square feet	not required
500-1000 square feet	5 ft x 5 ft
1000-1750 square feet	5 ft x 8 ft
Over 1750 square feet	engineer calculations required (see Appendix C)

High Point Community: Site Drainage Technical Standards

- Existing and replacement soil shall be uncompacted to increase infiltration.
- Replacement soil shall meet the soil requirements in section 6.4.
- Soil not requiring replacement shall be amended with 3 inches of compost rototilled 6 to 8 inches deep.
- Bottom of conveyance garden shall be a 1% slope.
- Overflow shall be piped to a designated discharge point.
- Conveyance garden shall be planted with vegetation (see suggested plant list, section 8.1 and 8.2)
- Water depth shall be a maximum of 6 inches, from bottom to overflow elevation.
- For roof areas over 1750 square feet, a professional civil engineer must size facility and stamp drawings.



Conveyance garden

NTS



stormwater planters can add structure and beauty to an outdoor space

Option 4.2f: Stormwater planter

A stormwater planter is a structure that can detain and convey water from roof downspouts. It is most appropriate for smaller sites or adjacent to hardscape because water can be prevented from seeping into the soil. See section 2.3b for descriptions, details and requirements. A stormwater planter may only be credited as a conveyance zone option or as impervious surface credit, not both. See section 2.3 for impervious surface credit options.

Table 4.2f Stormwater planter dimensions

Planter area is based on 18 inches of planting mix on top of 6 inches of drain rock. These minimum dimensions are required for planter construction. More than one planter can be constructed to meet square foot requirements. For sizing requirements for impervious surface credit, see Table 2.3. If desired sizing or design differs from the requirements in this section, preferred drawings and calculations stamped by a professional civil engineer shall be submitted to DPD for review.

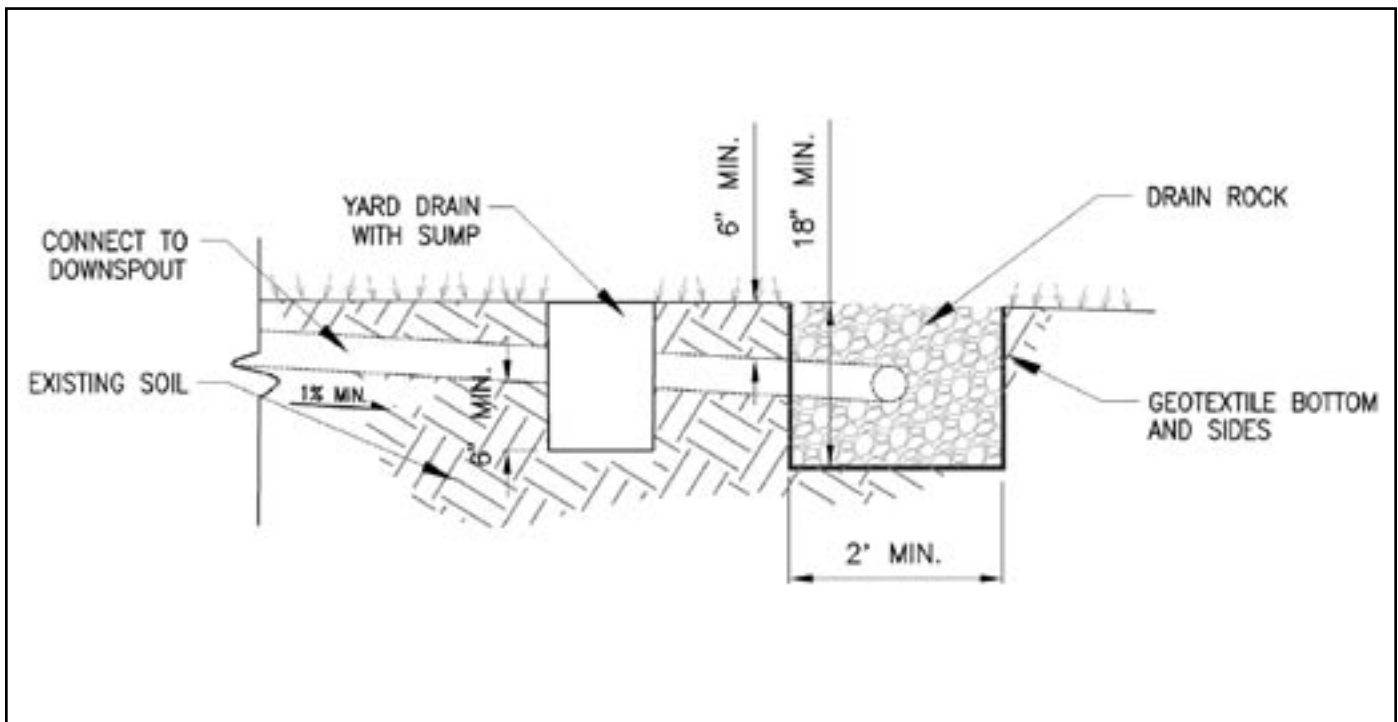
Roof Area	Stormwater planter area
Under 500 square feet	not required
500-1000 square feet	60 sf
1000-1750 square feet	100 sf
Over 1750 square feet	engineer calculations required (see Appendix C)

Option 4.2g: Dispersal trench

A dispersal trench is appropriate for situations where the slope from the building does not meet the minimum 1% requirement or is greater than 25% or there is not enough distance to surface convey between a building and the ROW.

A downspout may be piped directly to a dispersal trench as long as the trench meets the 8 foot minimum required conveyance distance. The pipe is connected to a perforated or slotted pipe that allows water to seep into the drain rock and surrounding soil as well as overflow across the site or sidewalk to a designated discharge point. Dispersal trenches shall be placed parallel to site contours.

- Runoff from impervious area shall surface flow on a slope between 1 and 20% or be piped to the dispersal trench.
- Dispersal trench shall be a minimum of 2 feet wide and 18 inches deep.
- Dispersal trench shall be a minimum of 8 feet long.
- Dispersal trench shall be lined with geotextile fabric and filled with drain rock.

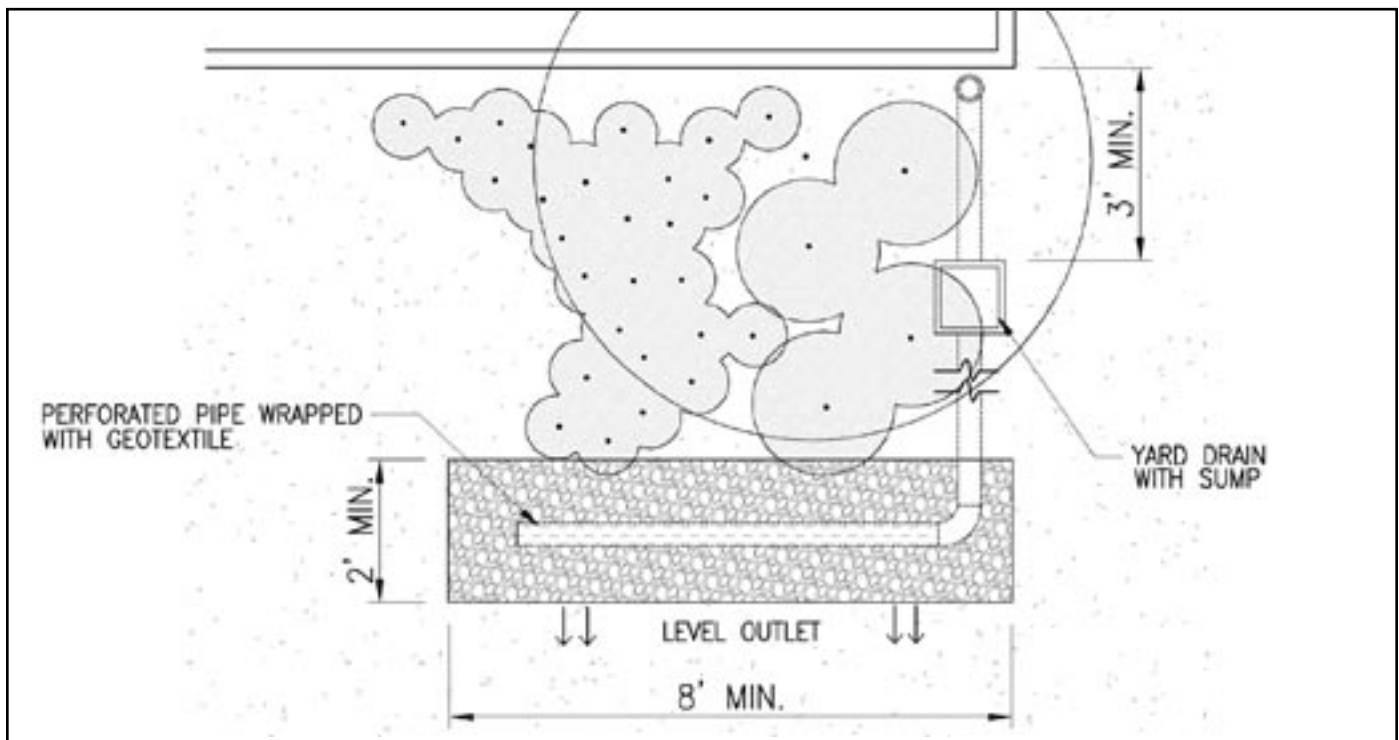


Dispersal trench section

NTS

High Point Community: Site Drainage Technical Standards

- Dispersal trench shall be a minimum of 5 feet from any building.
- Perforated pipes shall be a minimum of 6 inches below grade.
- Dispersal trench bottom and length shall be level and trench width shall have a slope of 1% toward a discharge point.
- Trench shall be placed parallel to site contours.
- Yard drain with a sump shall be installed upstream of the dispersal trench at a minimum of 3 feet upstream of the downspout.
- Dispersal trench may be topped with geotextile fabric and 6 inches of soil for planting.



Dispersal trench plan view

NTS

4.3 Transition to Right of Way zone options

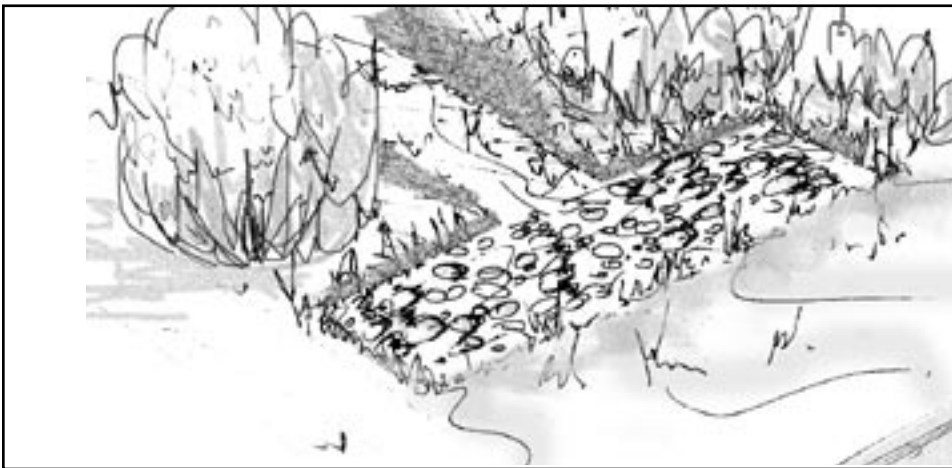
Once water is conveyed from the downspout toward a designated discharge point, it must properly flow to the ROW. Water must be spread 2 feet or more to avoid channeling of runoff at the ROW. The following options are required for slopes greater than 8% and/or roof areas over 1000 square feet. If the slope is less than 8% and roof area under 1000 square feet, a transition to ROW option is not required. These options are appropriate in the parent lot's interior area, from an alley or the ROW.

- If roof area draining to a transition to ROW zone is greater than 1750 sf, design shall be sized by a professional civil engineer.

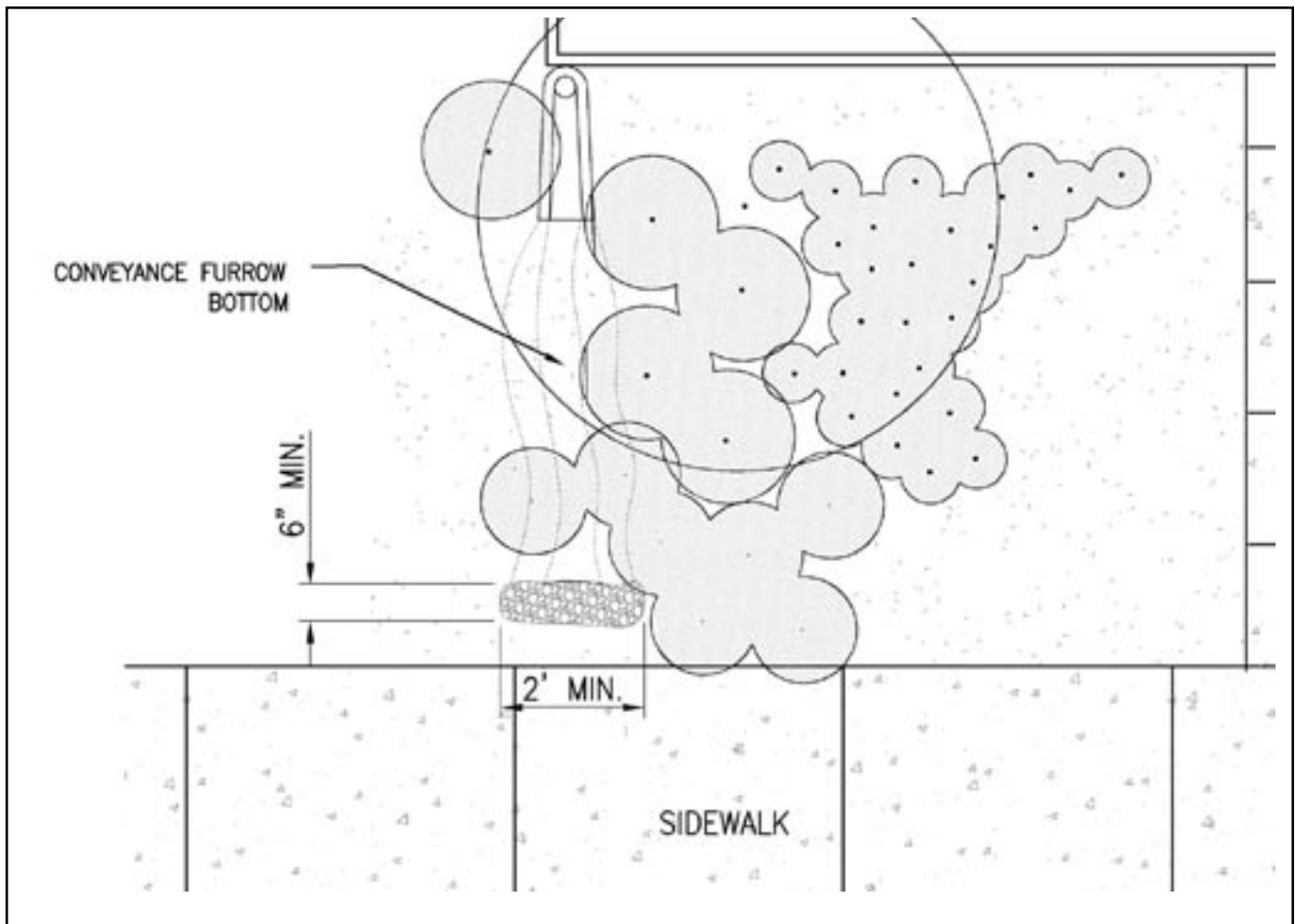
Option 4.3a: Gravel level spreader

A gravel level spreader is a pocket of gravel that collects water and allows it to sheet flow across the sidewalk.

- Material shall be drain rock.
- Gravel area shall be level. Any variation will channel flow.
- Gravel area shall be a minimum of 24 inches long, 6 inches wide and 8 inches deep.
- Level spreader shall be sited on private property, a minimum of 18 inches from the sidewalk or alley.
- Gravel area may be placed below surface and covered with geotextile fabric, 4 inches of soil and groundcover or grass (see section 8.1 for a suggested plant list) to fit with site landscape use.
- Level spreader shall be aligned to follow site contours.

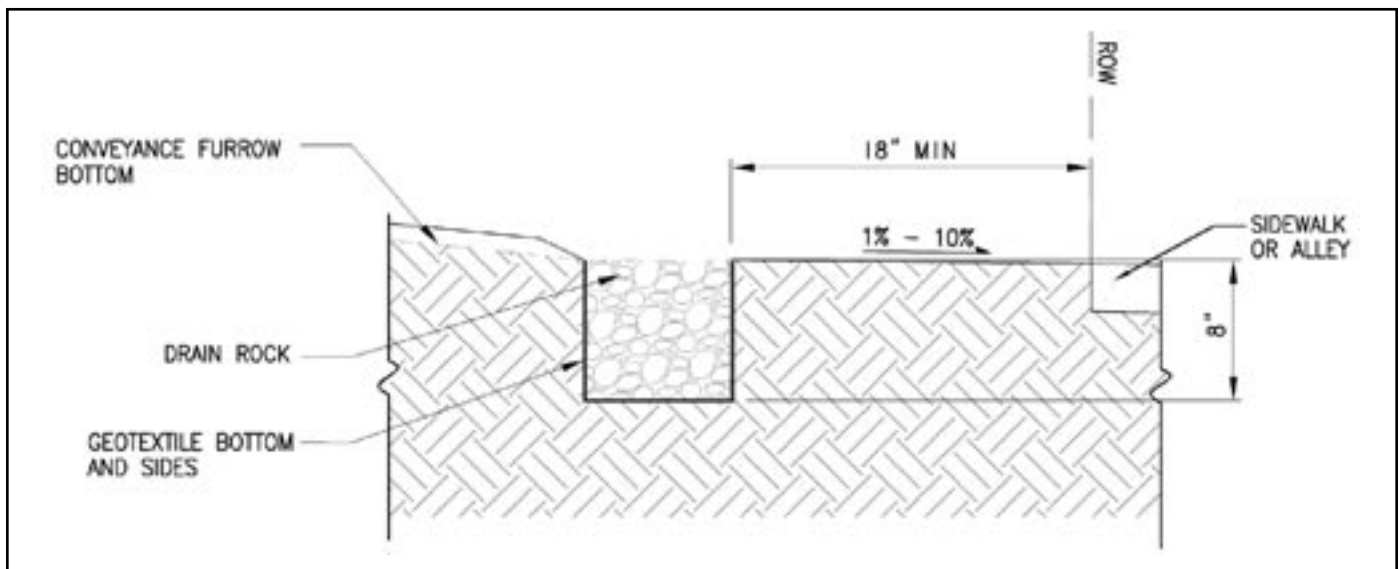


Gravel level spreader



Gravel level spreader plan view

NTS



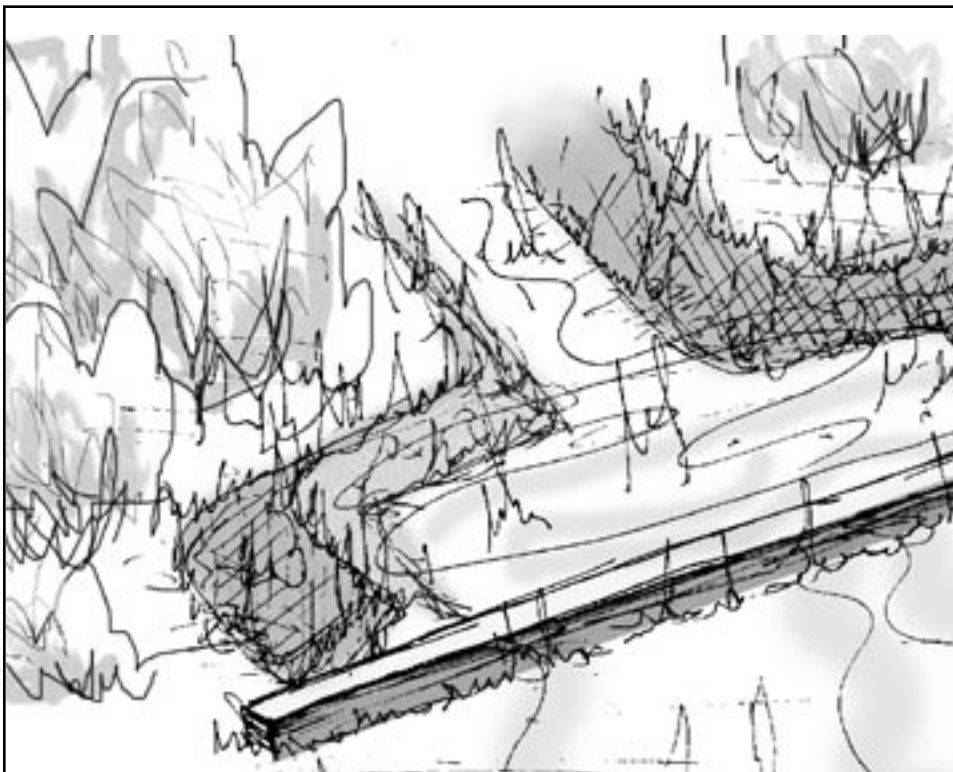
Gravel level spreader section

NTS

Option 4.3b: Plank level spreader

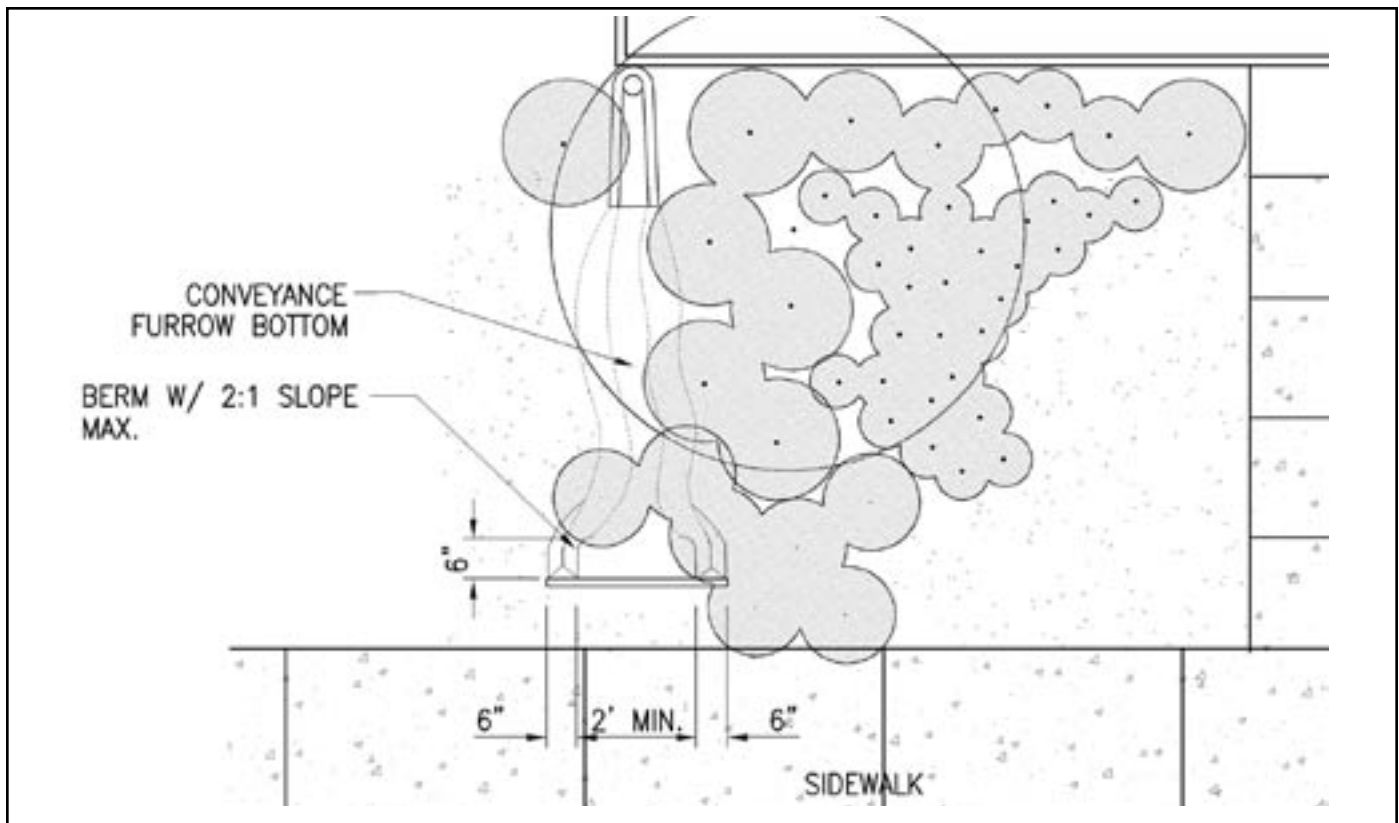
A plank level spreader collects water in a small depression behind a plank or board and allows it to sheet flow over the sidewalk.

- Plank shall be 2x8 recycled plastic or treated lumber.
- Plank shall be level. Any variation will channel flow.
- Plank shall be placed into a trench at a maximum of 1 inch above surface and backfilled.
- Plank shall be stabilized with 24 inch wood or metal anchors.
- Sides of depression shall be bermed at 2:1 maximum slope.
- Sides of depression shall be a minimum of 1 inch above plank to prevent overtopping on the sides.
- Depression behind plank shall be a minimum of 24 inches long, 6 inches wide and 3 inches deep.
- Plank shall be aligned to follow site contours.
- Area around spreader shall be landscaped to avoid disturbances.



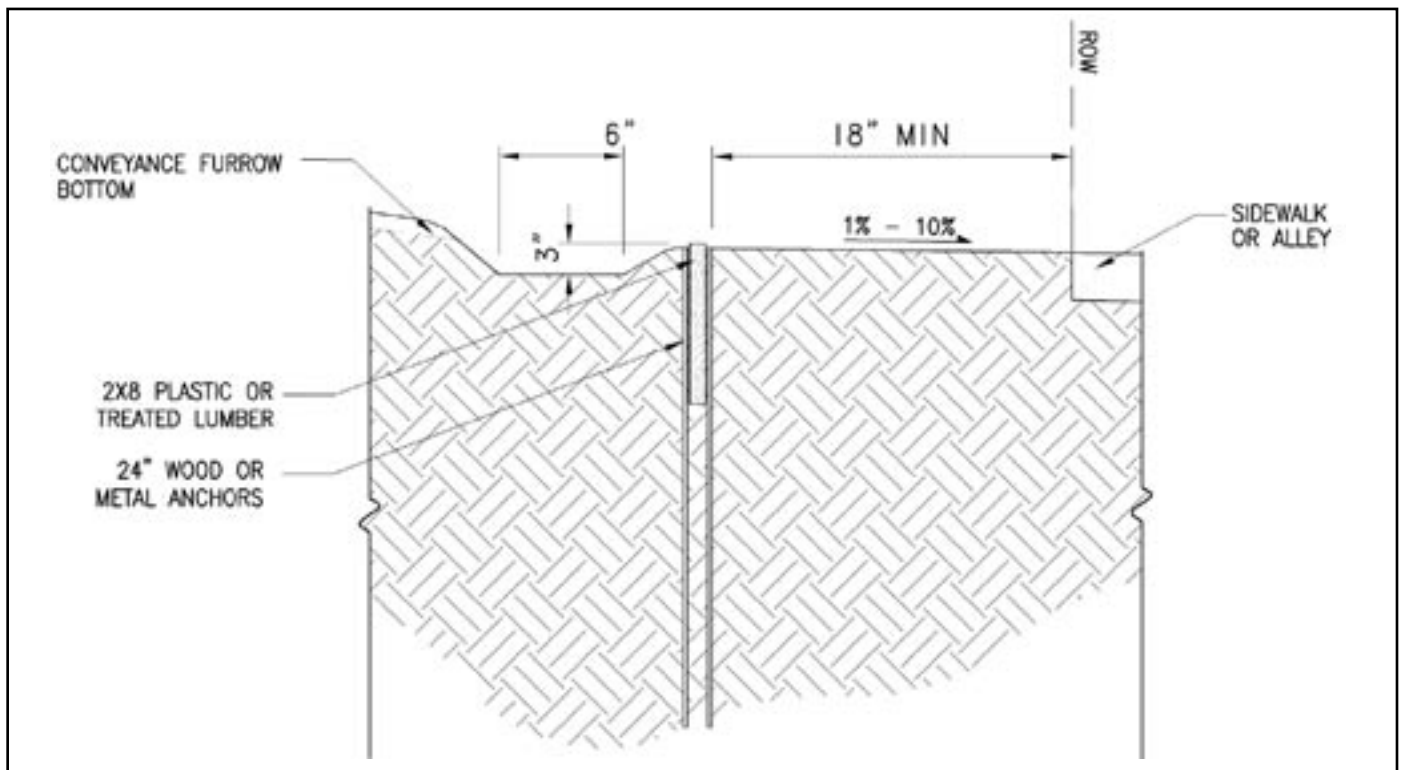
Plank level spreader

High Point Community: Site Drainage Technical Standards



Plank level spreader plan view

NTS



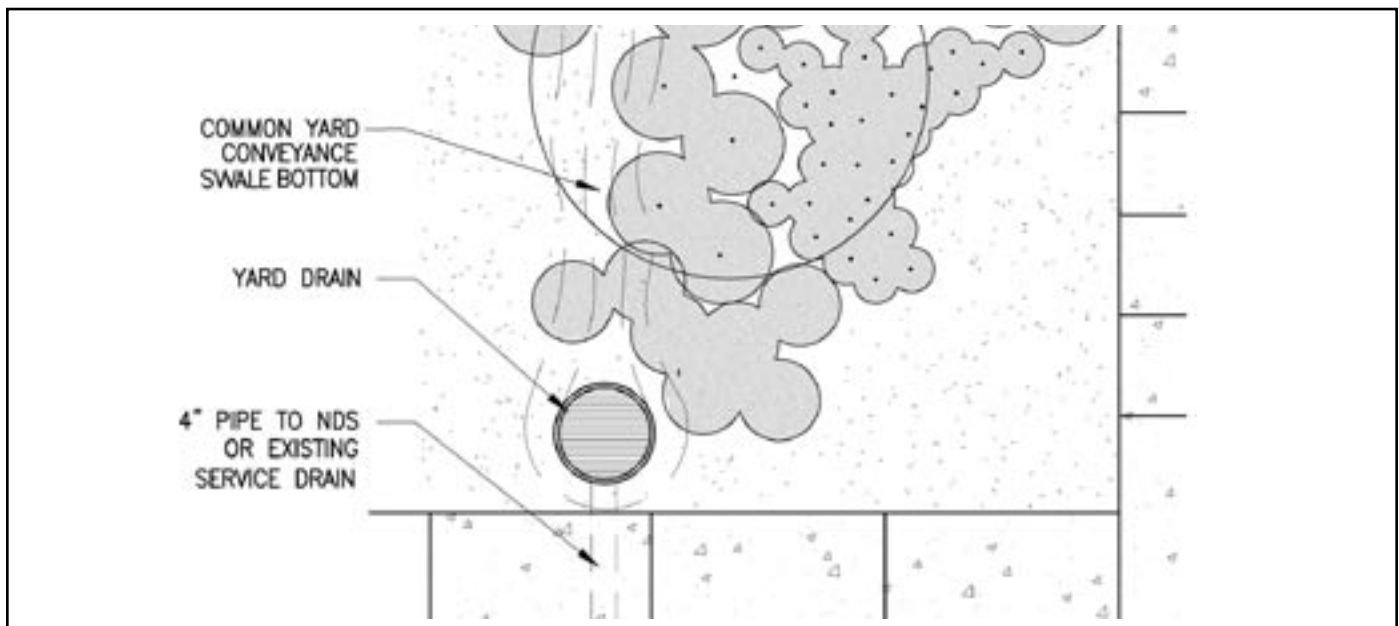
Plank level spreader section

NTS

Option 4.3c Yard drain

If the previous two options are not appropriate, discharge may be directed from the conveyance zone to a yard drain, area drain or catch basin and piped to the nearest service drain. This option is best suited to larger flows, such as that from a common yard conveyance furrow.

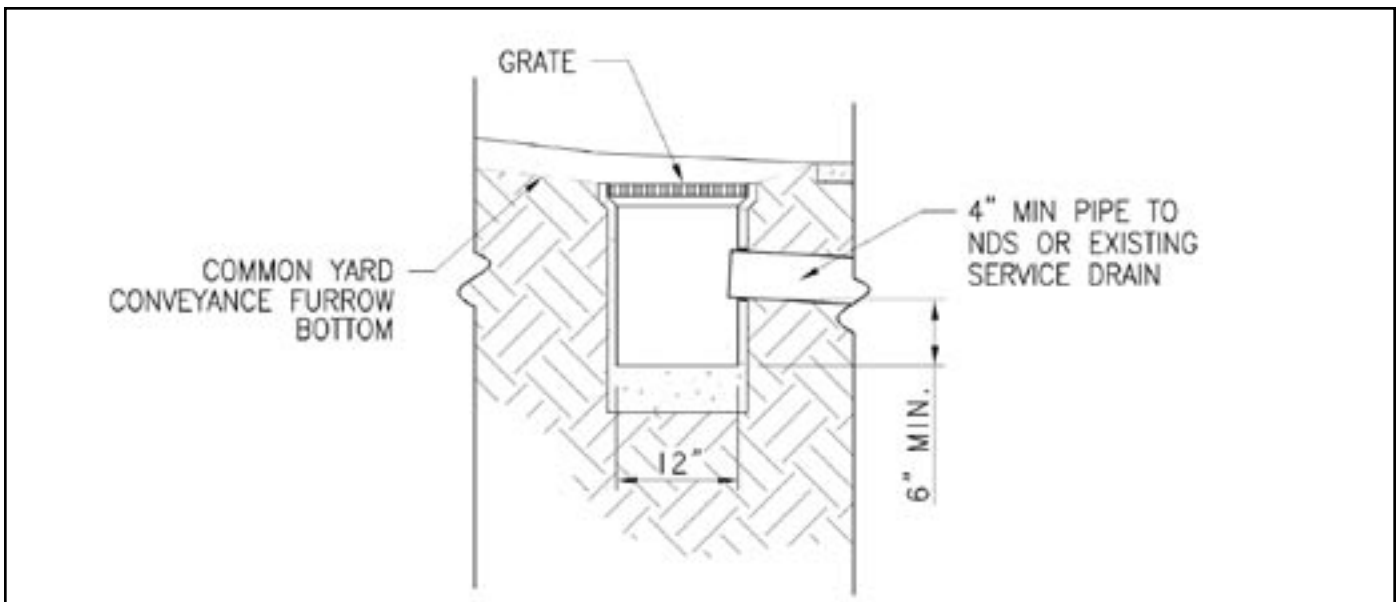
- Pipe shall be a minimum of 4 inches in diameter.
- Yard drain shall include an 18 inch minimum sump.
- Surrounding area shall be sloped at least 1% towards drain.
- If connecting to PSD, pipe shall connect to existing service drain.
- If connecting to NDS swale, invert elevation of pipe at yard drain shall be higher than swale overflow.
- Invert elevation of pipe at NDS shall be 2 inches above bottom of swale.
- A hole shall be augered for pipe connection.
- A grate over pipe at the NDS swale may be installed to prevent rodent access to pipe.



Yard drain plan view

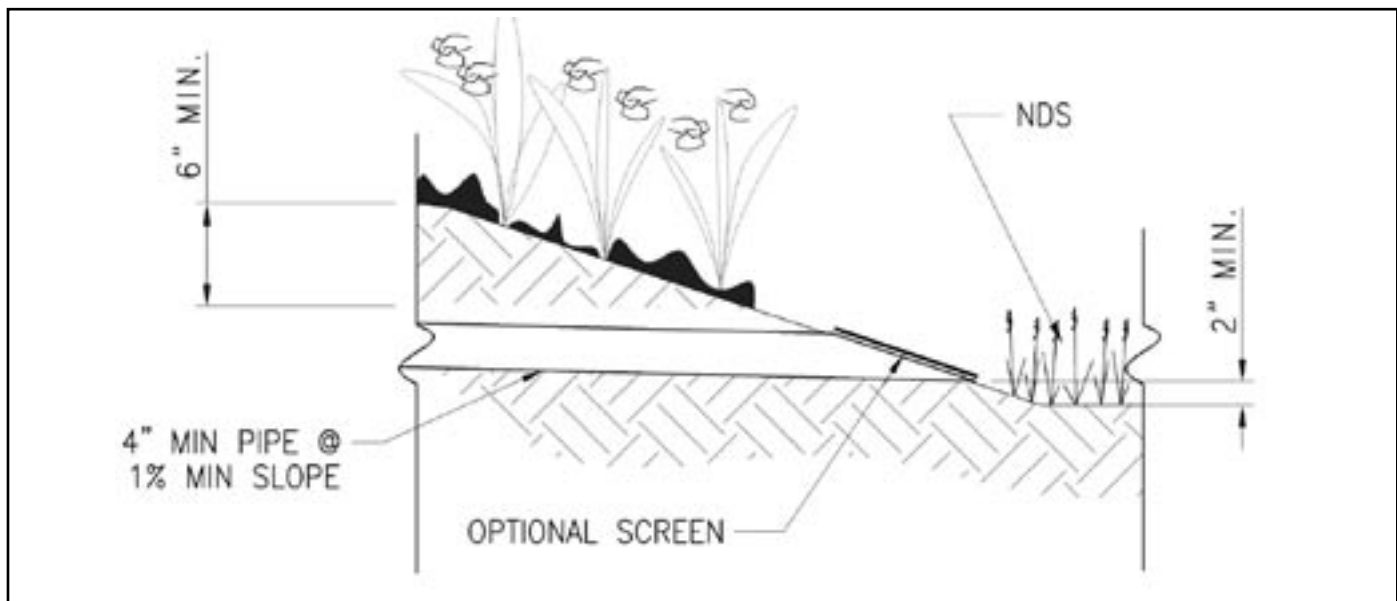
NTS

High Point Community: Site Drainage Technical Standards



Yard drain section

NTS

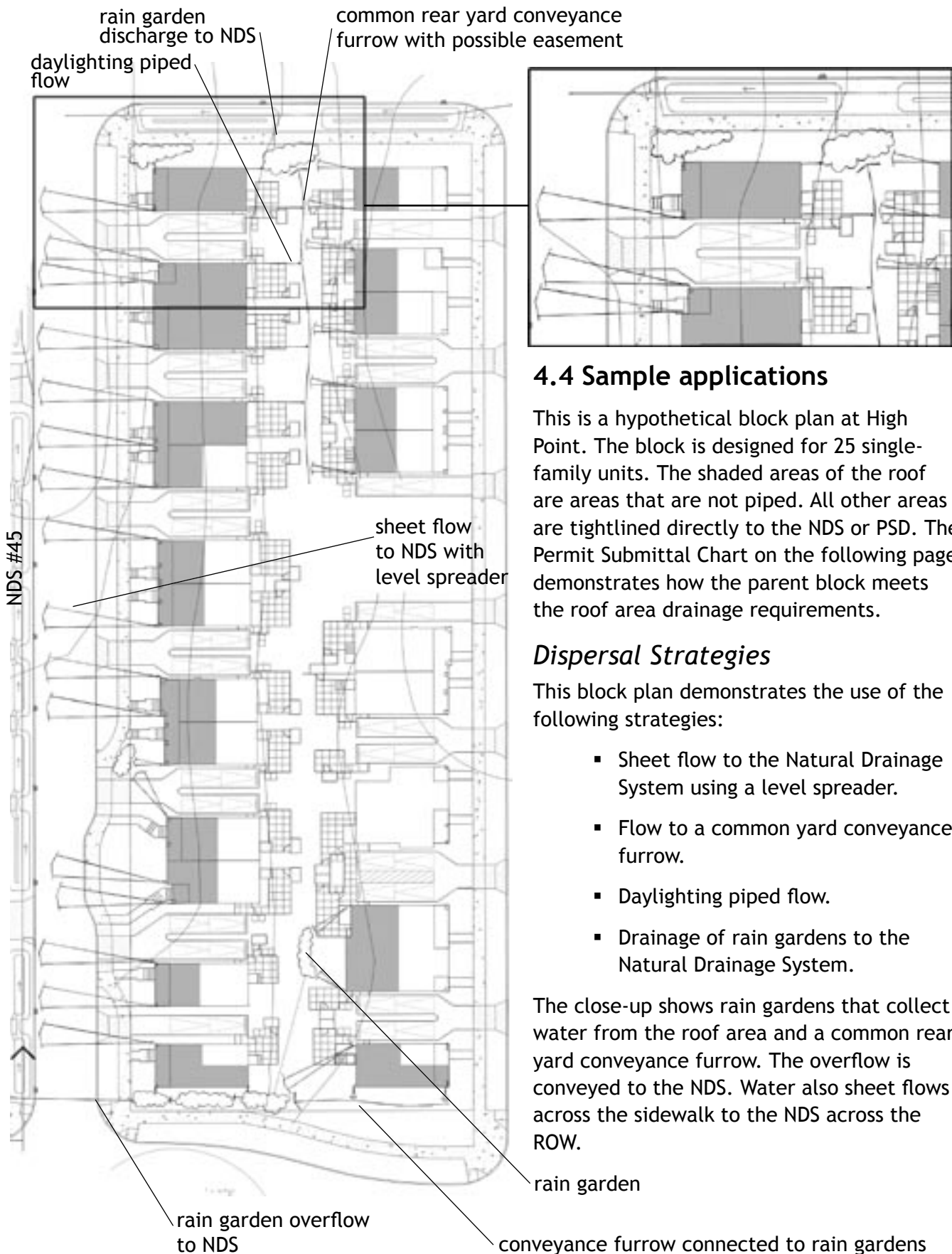


Pipe to NDS section

NTS

Page intentionally left blank

High Point Community: Site Drainage Technical Standards



4.4 Sample applications

This is a hypothetical block plan at High Point. The block is designed for 25 single-family units. The shaded areas of the roof are areas that are not piped. All other areas are tightlined directly to the NDS or PSD. The Permit Submittal Chart on the following page demonstrates how the parent block meets the roof area drainage requirements.

Dispersal Strategies

This block plan demonstrates the use of the following strategies:

- Sheet flow to the Natural Drainage System using a level spreader.
- Flow to a common yard conveyance furrow.
- Daylighting piped flow.
- Drainage of rain gardens to the Natural Drainage System.

The close-up shows rain gardens that collect water from the roof area and a common rear yard conveyance furrow. The overflow is conveyed to the NDS. Water also sheet flows across the sidewalk to the NDS across the ROW.

High Point Community: Site Drainage Technical Standards

Plat of High Point Community Permit Submittal Chart for Drainage Requirements

Undeveloped Lot

Block Number	3
Parent Lot Number	45
<u>Discharge Point and Method of Connection for Roof Downspouts</u>	
(A) Designated Discharge Point(s) (from Plat)	NDS #45
Site drains to the discharge point at 1% slope or greater? (If no, drainage may be piped to PSD (per Section 3 of Site Drainage Technical Standards and Paragraph B on Sheet 23b of the Plat))	Yes
(B) Total Roof Area (sf)	6,050 sf
(C) Allowable Percentage of Roof Area that may be Piped to the Discharge Point (% from plat)	60
(D) Proposed Percentage of Roof Area to be Piped to the Discharge Point (%) (round to nearest 5%)	55
(E) Selected downspout option(s) (choose from options in Technical Standards Manual)	4.1a, 4.1c
(F) Selected conveyance option(s) (choose from options in Technical Standards Manual)	4.2b, 4.2e
(G) Selected transition to ROW option(s) (choose from options in Technical Standards Manual)	4.3a

Flow Control

(1) Parent Lot Area (sf)	
(2) Allowable Impervious Surface Coverage (% from plat)	
(3) Allowable Square Footage of Impervious Surface Coverage (sf) $[(1) \times (2)]$	<i>refer to section 2.3 for a sample Permit Submittal Chart of "flow control"</i>
(4) Total Proposed Roof Area on Parent Lot (sf)	
(5) Proposed Impervious Vehicular Surface Coverage (sf)	
(6) Proposed Other Impervious Surface Coverage on Parent Lot (sf)	
(7) Total Proposed Impervious Coverage Area (sf) $[(4) + (5) + (6)]$	
(8) Total Percent Impervious Coverage Area (% of Parent Lot Area) $[(7) / (1)]$	
Flow Control Required? (Flow Control is required if (8) exceeds (2))	
(If Flow Control is Required) Total Impervious Area Requiring Flow Control $[(6) - (3)]$, minimum 2000sf]	
(If Flow Control is Required) If impervious area is less than 500 sf, selected detention option(s) (choose from options in Technical Standards Manual).	
Is water quality required? (Answer "yes" if proposed impervious surface is at least 500 sf over that allowed and vehicular impervious surface is over 5000 sf).	

* Detention and water quality treatment for all development within the High Point Community will be reviewed based on the requirements within the Site Drainage Technical Standards rather than the Stormwater Code sections on detention and water quality.

* Data in column shall be specific to each parent lot. Add columns if application includes more than one parent lot.

Checklist

- ☐ Complete Permit Submittal Chart for Drainage Requirements for Undeveloped Lot.
- ☐ Provide site plan with existing and proposed impervious surfaces, buildings and roof outlines.
- ☐ Provide grading plan with existing and proposed contours.
- ☐ Indicate proposed roof area to be piped. Hatch or shade on plan.
- ☐ Indicate proposed connection location and type from piped downspouts to designated discharge point on plan.
- ☐ Indicate proposed location and type of conveyance from remaining downspouts to designated discharge point on plan.
- ☐ Indicate proposed locations and transition options where runoff crosses sidewalk or vehicular area on plan.
- ☐ Indicate non-piped downspouts serving over 1750 sf of roof area and provide calculations for conveyance and transition to ROW from a professional civil engineer.

High Point Community: Site Drainage Technical Standards

5 CHANGES TO THE PLAT

The following excerpt is from Exhibit B of the Covenant of High Point Community:

Changes to plat. If any lot is re-divided, reconfigured through lot boundary adjustment, or a unit lot is aggregated with another unit lot or lots to form a larger building site, the percentage of impervious surface coverage for each new or reconfigured lot, parcel or site shall be the same as is established on this sheet for its parent lot. If the development proposed for the new or reconfigured lot, parcel or site would result in impervious surface coverage exceeding the percentage established for the parent lot, flow control shall be provided pursuant to paragraph C.2 above.

5.1 Unit lot modifications

Unit lot lines may be modified according to the Plat. Adjustments to unit lot lines do not alter the impervious surface or piped downspout allowances for the parent lot.

5.1 Merging of parent lots

There are two options available for developments that span parent lot lines. These options apply only to contiguous parcels.

Development spans existing parent lots (additional permitting action required):

- Impervious surface area allowance: Allowances remain the same per parent lot. Each parent lot impervious surface area is calculated individually and shall not be combined with other parent lots. If a downspout collects roof area from more than one lot, the roof area that is collected will be calculated as impervious roof area on the lot where the downspout is located.
- Piped downspout allowance: Downspouts are calculated for individual parent lots.
- A permit submittal chart shall be completed for each parent lot.

Lot line or lot boundary adjustment to merge parent lots:

- Impervious surface area allowance: add impervious square foot area allowances for original parent lots and divide by total square foot area. This gives the percentage of impervious allowed for the newly adjusted parent lot(s).

*Ex: (25,000 sf parent lot area x 60% allowable
impervious) + (20,000 sf parent lot area x 62% allowable
impervious) / 45,000 sf
= 61% or 27,400 allowable impervious.*

High Point Community: Site Drainage Technical Standards

- Piped downspout allowance: Add the allowable percentage of piped roof area and divide by the number of parent lots. This gives the percentage of piped downspouts allowed for the newly adjusted parent lot(s).

Ex: 25% allowable piped + 75% allowable piped + 10% allowable piped / 3

= 36.67% (rounded to 37%) allowable piped downspouts

The total allowable impervious surface square foot area may not be increased under any circumstance.

6 CONSTRUCTION MANAGEMENT

The NDS is designed to convey stormwater from the ROW and surrounding areas. The NDS includes the individual vegetated and grass swales, porous paving sidewalks, overflows between the swales, trenches on driveways and alleys and street drainage. Each part of the system must be protected for it to function as intended. Because the NDS serves a critical function in the High Point Community, it must be protected from damage during lot development as well as day to day activities. See Volume 2 of the Construction Stormwater Control Technical Manual of Title 22.800 Stormwater, Grading and Drainage Control Code for more information.

6.1 Temporary Erosion and Sediment Control during lot development

Requirements in this section are intended to provide prevention, control and abatement of water pollution and erosion within the limits of the development area. Without erosion and sediment control measures during construction, onsite soils may wash off the site, thus decreasing the quality of onsite soils, clogging the NDS and PSD, harming Longfellow Creek, and damaging existing developments and surrounding lots. Any development requires measures to eliminate erosion onsite.

The following measures are **required**:

- Construction site entrance shall have wheel-cleaning stations to clean wheels and undercarriage of trucks before leaving the site. This is to prevent sediment from being carried onto public streets.
- Silt fencing and filter fabric shall be installed to prevent sediment from being carried off the site by stormwater runoff.
- Exposed earth shall be covered with one or more of the following: seed mix of clover and rye, compost and wood fiber, straw mulch, or compost.
- Collection structures such as sumps, culverts, ditches and sediment ponds shall be installed to ensure that sediment-laden water does not leave the site or enter the NDS or PSD.
- NDS shall remain free of debris, material, equipment, chemicals, sediment or sediment-laden water at all times to allow for drainage.
- Roof area drainage conveyance areas shall be protected from erosion during plant or grass establishment period of at least one year with temporary measures.

6.2 Temporary Erosion and Sediment Control during lot modifications

Requirements in this section are intended to provide prevention, control and abatement of water pollution and erosion within the limits of the modification area. Without these control measures during modifications onsite soils may wash off the site, decreasing onsite soil quality, clogging the NDS and PSD, harming Longfellow Creek, and damaging surrounding developments. Any modification to existing development is required to take measures to eliminate erosion onsite. In addition to the requirements in section 6.1, the following measures are required:

- Existing roof area drainage conveyance areas identified to remain shall be protected from damage during construction.

6.3 Routine NDS protection

The NDS shall be protected during construction. This will require measures such as fencing to prevent damage to the area and to delineate areas to be protected from active construction areas. Applicants will be required to remedy any effects to the NDS caused by construction.

The following are **not** permitted:

- Storing debris, materials or equipment in the NDS or on porous paving. This includes, but is not limited to: lumber, stone, soil, vegetation, sand, gravel, paint, machinery or other construction material.
- Vehicular or heavy equipment access across NDS or porous paving
- Pedestrian access across vegetated NDS cells (pedestrian access is allowed at crossings between NDS cells).
- Dumping or staging of any material or liquids in NDS or on porous paving (sidewalk or street). This includes, but is not limited to: wood, soil, vegetation, sand, gravel, paint, chemicals, oils, or other construction material.
- Removing or adding vegetation in NDS.

The following are **required**:

- Identification and enforcement of construction vehicle traffic routing to restrict vehicle access on porous pavement street.
- To ensure NDS and porous sidewalk protection, at minimum, an orange construction fence shall be placed to delineate these areas to be protected and off limits. Where applicable, filter fence shall also be placed.

If construction causes negative effects to the NDS, remedies may be required. Remedies may include, but are not limited to the following:

- If limited quantities of sediment run onto the porous sidewalk or roadway material, area shall be vacuum swept or pressure washed.
- If structural integrity of permeable walkway is compromised or sediment removal methods are determined to be ineffective, porous sidewalk shall be removed and replaced.
- If limited quantities of sediment run onto the NDS swales, the upper 3-inches of NDS swale soil mix and vegetation shall be replaced with accepted material.
- If NDS soil is compacted by vehicular loading, the full NDS soil profile shall be replaced per Street Improvement Plans and Specifications.

6.4 Soil amendment

Most soils in the High Point Community do not sufficiently drain, retain or infiltrate site stormwater. Soils in conveyance or detention areas shall be amended with composted material to improve permeability and water-holding capacity. Amending soil with mulch and/or rototilling soil may reduce site erosion.

Soil amendments shall meet the following requirements:

- Soil amendment shall consist of composted vegetation or organic waste material and shall consist of 100% recycled content.
- Material shall be fully composted, mature and stable.

Soils for stormwater planter shall meet the following specification:

- Soil shall consist of the approximately 30 to 35% composted material, 65-70% gravelly sand.
- Material shall be mixed together to achieve a uniform consistency.
- Cedar Grove Vegetable Garden Mix or similar mix may be used.

7 DEFINITIONS AND ABBREVIATIONS

Aggregate discharge subbase: free-draining 3/8 inch to 3/4 inch uniformly graded coarse crushed gravel with minimum fines. It is a vehicular pavement subcourse.

Amended soil: existing soils that are enhanced with organic material.

Conveyance furrow: a shallow linear or meandering depression that conveys water from a downspout to a designated discharge point. It can be grass-lined or vegetated. It is less than 3 feet in width at the top.

Conveyance pipe: a subsurface pipe that carries water from its collection source to a designated discharge point.

Designated discharge point: the location, as defined by Sheet 23b of the Plat, for the discharge of a parent lot's drainage. This can be an NDS adjacent to a parent lot and/or the PSD.

Drain gravel: free-draining 3/4 inch minus angular gravel with less than 1% fines. It is a pavement subcourse.

Drain rock: free-draining rounded and washed rock between 1 and 2 inches with less than 0.5% fines.

Flow control: controlling the discharge rate of stormwater runoff from the site or parcel. This can be done through infiltration or detention of stormwater.

Daylight piped flow: the daylighting or releasing of piped roof area drainage to a conveyance zone.

Grass-lined swale: a linear trench that conveys or infiltrates water. It is planted with grass and mown similarly to a lawn or sidewalk planting strip.

Gravel berm: washed gravel placed at intervals along a conveyance furrow with a greater than 8% slope to slow the velocity of stormwater or roof run-off (similar to gravel check dam).

Impervious: not allowing water to infiltrate, such as a typical sidewalk, driveway or roof.

Infill gravel: clean, washed, fine angular gravel, typically 3/16 inch to 3/8 inch. Used to fill porous gravel mat.

Infiltration: the seeping of stormwater into the soil.

Lateral flow/lateral release: the horizontal flow of stormwater below a porous paving surface to a designated discharge point.

Level spreader: a gravel pocket or plank that spreads stormwater to allow it to sheet flow across a surface.

Native plants: vegetation that would have grown in the area before any development. These plants are low-maintenance and do not require much, if any, watering because they are adapted to the conditions (see suggested plant list, section 8).

Natural Drainage System: a method of drainage management that filters, infiltrates and conveys water through surface swales with amended soil. Some of the benefits can be decreased flow of water into Longfellow Creek, improved water quality, and decreased maintenance and installation costs.

NDS: Natural Drainage System.

Perforated pipe: slotted or perforated pipe that is punctured to allow water to seep in and sized for flow volumes for the 2-year, 24-hour or 25-year, 24-hour storm event.

Porous: allowing water to pass through, such as soil, vegetated areas and drain gravel.

PSD: Public Storm Drain.

Public Storm Drain: part of a public drainage control system which is wholly or partially piped, is owned and operated by a public entity, and is designated to carry only drainage water.

Right of Way: Publicly owned property between property lines. This is where the NDS, utilities, public sidewalks and streets are located.

ROW: Right of Way

Sand: free-draining aggregate less than 1/4 inch. Commonly referred to as pit run sand.

Sandy gravel: free-draining aggregate 1/4 to 3/4 inch with minimum fines. Commonly referred to as pit run sandy gravel.

Soil: a medium suitable for planting. It shall contain mineral and organic matter that provides nutrients to vegetation. Site soils may be amended with organic matter to improve their quality.

Stormwater: rainfall that infiltrates into the ground or runs along the surface and collects elsewhere.

Surface: any plane, such as a roof, sidewalk, or lawn. It can be pervious or impervious.

Vegetated conveyance furrow: a trench that filters, infiltrates and conveys stormwater. It is planted with perennials and woody herbaceous species (see suggested plant list, section 8).

8 SUGGESTED PLANT LIST

The following plants are appropriate for use in conveyance furrows, rain gardens, driveway centerlines and other areas of a site. This list is not exhaustive and other plants may be appropriate. Soil conditions, sun exposure, maintenance and foot traffic can affect the success of any vegetation. Please consider individual site conditions during plant selection.

8.1 Conveyance furrow/conveyance garden floor/rain garden floor/stormwater planter/gravel level spreader

Aquilegia formosa, Western columbine

Carex deweyana, Dewey sedge

Carex montana, Mountain sedge

Carex obnupta, Slough sedge

Deschampsia cespitosa, Tufted hair grass

Hemerocalis, Day lily

Juncus effuses, Soft rush

Juncus patens, California gray rush

Avoid planting woody herbaceous species and trees in rain garden and conveyance furrow floor.

8.2 Conveyance furrow/conveyance garden banks/rain garden banks/contoured land

Acer circinatum, Vine maple *

Amelanchier alnifolia, Serviceberry *

Cornus kelseyii, Kelsey dogwood

Gaultheria shallon, Salal *

Polystichum munitum, Sword fern *

Ribes sanguineum, Red-flowering currant *

Rubus spectabilis, Salmonberry *

Salix purpurea 'Nana', Purple osier willow



Carex obnupta



Polystichum munitum



Fragaria chiloensis

8.3 Driveway centerline

Arctostaphylos uva-ursi, Kinnikinnick *

Fragaria chiloensis, Beach strawberry *

Isotoma fluviatillis, Blue star creeper

Mazus reptans, Creeping mazus

Thymus serpyllum, Creeping thyme

8.4 Paver joints

Fragaria chiloensis, Beach strawberry *

Isotoma fluviatillis, Blue star creeper

Mazus reptans, Creeping mazus

Thymus serpyllum, Creeping thyme

* Native species

RESOURCES

City of Seattle, *Volume 3: Flow Control Technical Requirements Manual*, Seattle, WA, November 2000

Ewing, Reid, *Best Development Practices*, Chicago, IL, American Planning Association, 1996

Hunt, W.F., et. al., *Designing Level Spreaders to Treat Stormwater Runoff*, NC DOT Level spreader workshop, February 2001

Invisible Structures, Inc., *Gravelpave2 Porous Paving System*, <http://www.invisiblestructures.com/GV2/gravelpave.htm>

King County Department of Natural Resources and Parks, *Surface Water Design Manual*, King County, Washington 1998

King County Department of Natural Resources and Parks, *Surface Water Design Manual, Appendix C: Small Project Drainage Requirements*, King County, Washington February 2004

Kinkade-Levario, Heather, "Integrated water conservation strategies for LEED points", *Landscape Architecture*, April 2004

Konowalchuk, Wally, *Country Lanes: A Demonstration Project*, City of Vancouver, 2003

Lake MacQuarie City Council, *Erosion and Sedimentation Control System*, http://www.lakemac.infohunt.nsw.gov.au/erosion/level_spreader.htm, 2000

Marinelli, Janet, *Good to the Last Drop*, <http://magazine.audubon.org/backyard/backyard0309.html>, September 2003

Virginia Department of Forestry, *Rain Gardens*, <http://www.vdof.org/rfb/rain-gardens.shtml>, 2004

High Point Community: Site Drainage Technical Standards



APPENDIX A

Permit Submittal Chart for Drainage Requirements

The charts on the following pages may be required to be completed for Master Use Permit and Building Permit submittals. This chart will outline an applicant's proposed drainage approach for a parent lot. A separate chart shall be completed. The chart for Undeveloped Lots is used for lots where there is no existing development. **If there are future modifications to the development, use the submittal chart for Lot Modifications to Existing Development.**

The following information is a guide to completing the Permit Submittal Chart for High Point Community. It defines each portion of the table to better explain the meaning.

Block number: the block that the parent lot is in.

Parent lot number: the lot within the larger block.

Discharge Point and Method of Connection for Roof Downspouts

(A) Designated Discharge Point: See Appendix B for a copy of Sheet 23b of the Plat of High Point Community for discharge point(s) designated for a specific parent lot.

(B) Total Roof Area is the square foot area of building roofs, including residences, garages, carports and sheds.

(C) Allowable Percentage of Roof Area to Be Piped to the Discharge Point: See Sheet 23b of the Plat (see Appendix B) for allowances for a specific parent lot.

(D) Proposed Percentage of Roof Area to be Piped to the Discharge Point is the roof area approximated to the nearest 5% that is connected to the PSD directly. This must be at or below the allowable percentage. To calculate a building's roof area per downspout, divide the total roof area of a building (as if it were a flat plane) and divide by the number of downspouts.

(E) Selected Downspout Options: See Section 4.1 for options.

(F) Selected Conveyance Options: See Section 4.2 for options.

(G) Selected Transition to ROW Options: See Section 4.3 for options.

(H) Proposed changes to downspout options: (for modifications to developed lots only) Note any removal or addition of downspout zone options. See section 4.1 for options.

(I) Proposed changes to conveyance options: (for modifications to



High Point Community: Site Drainage Technical Standards

developed lots only) Note any removal or addition of conveyance zone options. See section 4.2 for options.

(J) Proposed changes to transition to ROW options: (for modifications to developed lots only) Note any removal or addition of transition to ROW options. See section 4.1 for options.

Flow control for Undeveloped Lots

(1) *Parent Lot Area* is the total square footage of the parent lot, including developed and undeveloped areas.

(2) *Allowable Impervious Surface Coverage* is taken from the Sheet 23b of the plat (see Appendix B). The percent allowed varies from parent lot to parent lot. Impervious coverage includes all roof areas as well as any non-porous surface on the ground, such as concrete or asphalt paving.

(3) *Allowable Square Footage of Impervious Surface Coverage* is the same as above, but it is quantified in square feet.

(4) *Total Roof Area on Parent Lot* is the same as *Total Roof area* above.

(5) *Proposed Other Impervious Surface on Parent Lot* includes all non-porous surfaces, such as patios, paths, stairs and decks.

(6) *Total Proposed Impervious Area* is the sum of total square footage of roof area and proposed other impervious surface area on the parent lot.

(7) *Total Percent Impervious Area* is the percentage of the parent lot that is impervious.

Flow Control is required if the percent impervious (7) is greater than the allowable impervious coverage (2).

Flow Control is Required for the area of impervious that exceeds the allowable square footage.

Plat of High Point Community
Permit Submittal Chart for Drainage Requirements

Undeveloped Lot

Block Number	
Parent Lot Number	

Discharge Point and Method of Connection for Roof Downspouts

(A) Designated Discharge Point(s) (from Plat)	
Site drains to the discharge point at 1% slope or greater? (If no, drainage may be piped to PSD (per Section 3 of Site Drainage Technical Standards and Paragraph B on Sheet 23b of the Plat))	
(B) Total Roof Area (sf)	
(C) Allowable Percentage of Roof Area that may be Piped to the Discharge Point (% from plat)	
(D) Proposed Percentage of Roof Area to be Piped to the Discharge Point (%) (round to nearest 5%)	
(E) Selected downspout option(s) (choose from options in Technical Standards Manual)	
(F) Selected conveyance option(s) (choose from options in Technical Standards Manual)	
(G) Selected transition to ROW option(s) (choose from options in Technical Standards Manual)	

Flow Control

(1) Parent Lot Area (sf)	
(2) Allowable Impervious Surface Coverage (% from plat)	
(3) Allowable Square Footage of Impervious Surface Coverage (sf) $[(1) \times (2)]$	
(4) Total Proposed Roof Area on Parent Lot (sf)	
(5) Proposed Impervious Vehicular Surface Coverage (sf)	
(6) Proposed Other Impervious Surface Coverage on Parent Lot (sf)	
(7) Total Proposed Impervious Coverage Area (sf) $[(4) + (5) + (6)]$	
(8) Total Percent Impervious Coverage Area (% of Parent Lot Area) $[(7) / (1)]$	
Flow Control Required? (Flow Control is required if (8) exceeds (2))	
(If Flow Control is Required) Total Impervious Area Requiring Flow Control $[(6) - (3)]$, minimum 2000sf]	
(If Flow Control is Required) If impervious area is less than 500 sf, selected detention option(s) (choose from options in Technical Standards Manual).	
Is water quality required? (Answer "yes" if proposed impervious surface is at least 500 sf over that allowed and vehicular impervious surface is over 5000 sf).	

* Detention and water quality treatment for all development within the High Point Community will be reviewed based on the requirements within the Site Drainage Technical Standards rather than the Stormwater Code sections on detention and water quality.

* Data in column shall be specific to each parent lot. Add columns if application includes more than one parent lot.

Checklist

- ☐ Complete Permit Submittal Chart for Drainage Requirements for Undeveloped Lot.
- ☐ Provide site plan with existing and proposed impervious surfaces, buildings and roof outlines.
- ☐ Provide grading plan with existing and proposed contours.
- ☐ Indicate proposed roof area to be piped. Hatch or shade on plan.
- ☐ Indicate proposed connection location and type from piped downspouts to designated discharge point on plan.
- ☐ Indicate proposed location and type of conveyance from remaining downspouts to designated discharge point on plan.
- ☐ Indicate proposed locations and transition options where runoff crosses sidewalk or vehicular area on plan.
- ☐ Indicate non-piped downspouts serving over 1750 sf of roof area and provide calculations for conveyance and transition to ROW from a professional civil engineer.

Plat of High Point Community
Permit Submittal Chart for Drainage Requirements

Modification of Developed Lots

Block Number	
Parent Lot Number	

Discharge Point and Method of Connection for Roof Downspouts

(A) Designated Public Drainage Control Systems(s) (from Plat)	
Site drains to the discharge point at 1% slope or greater? (If no, drainage may be piped to PSD (per section 3 of Site Drainage Technical Standards and Paragraph B on Sheet 23b of the Plat))	
(B) Total Roof Area (new plus existing) (sf)	
(C) Allowable Percentage of Roof Area that may be Piped to the Discharge Point (% from plat)	
(D) Proposed Percentage of Roof Area to be Piped to the Discharge Point (%) (round to nearest 5%)	
(E) Existing downspout option(s)	
(F) Existing conveyance option(s)	
(G) Existing transition to ROW option(s)	
(H) Proposed changes to downspout option(s) (chose from options in Technical Standards Manual)	
(I) Proposed changes to conveyance option(s) (chose from options in Technical Standards Manual)	
(J) Proposed changes to transition to ROW option(s) (chose from options in Technical Standards Manual. Write "none" if slope is less than 8%)	

Flow Control

(1) Parent Lot Area (sf)	
(2) Allowable Impervious Surface Coverage (% from plat)	
(3) Allowable Square Footage of Impervious Surface Coverage (sf) $[(1) \times (2)]$	
(4) Total Existing Impervious Surface Coverage on Parent Lot (sf)	
(5) Total Proposed Replaced Impervious Surface Coverage on Parent Lot (sf)	
(6) Total Proposed New Impervious Surface Coverage on Parent Lot (sf)	
(7) Total Proposed Impervious Surface Coverage on Parent Lot (sf) $[(4) + (6)]$	
(8) Total Proposed Impervious Surface Coverage (% of Parent Lot) $[(6)/(1)]$	
(9) Total Percent Impervious Area (% of Parent Lot Area) $[(7)/(1)]$	
Flow Control Required? (Flow Control is required if (8) exceeds (2))	
(If Flow Control is Required) Total Impervious Area Requiring Flow Control $[(7)-(3)]$, minimum 2000sf]	
(If Flow Control is Required) If impervious area is less than 500 sf, selected detention option(s) (chose from options in Technical Standards Manual).	
Is water quality required? (Answer "yes" if total impervious surface is at least 500 sf over that allowed and vehicular impervious surface is over 5000 sf).	

* Detention and water quality treatment for all development within the High Point Community will be reviewed based on the requirements within the Site Drainage Technical Standards rather than the Stormwater Code sections on detention and water quality.

* Data in column shall be specific to each parent lot. Add columns if application includes more than one parent lot.

Checklist

- ☐ Complete Permit Submittal Chart for Drainage Requirements for Modification of Developed Lot.
- ☐ Provide site plan with existing and proposed impervious surfaces, buildings and roof outlines.
- ☐ Provide grading plan with existing and proposed contours.
- ☐ Indicate proposed roof area to be piped. Hatch or shade on plan.
- ☐ Indicate proposed connection location and type from piped downspouts to designated discharge point on plan.
- ☐ Indicate proposed location and type of conveyance from remaining downspouts to designated discharge point on plan.
- ☐ Indicate proposed locations and transition to ROW options where runoff crosses sidewalk or vehicular area on plan.
- ☐ Indicate non-piped downspouts serving over 1750 sf of roof area and provide calculations for conveyance and transition to ROW from a professional civil engineer.

APPENDIX B

Sheet 23b of the Plat of High Point Community

The table on the following page is taken from Sheet 23b of the Plat of High Point Community. The table shows the drainage requirements for every parent lot. This information will be necessary in determining the drainage approach for a parent lot and for completing the Permit Submittal Chart in Appendix A.



DRAINAGE THRESHOLDS TABLE

BLOCK	PARENT LOT	ALLOWABLE PERCENT IMPERVIOUS SURFACE COVERAGE (%) PER PARENT LOT	DESIGNATED PUBLIC DRAINAGE CONTROL SYSTEM FOR DISCHARGE POINT *SEE NOTE 2	PERCENT OF PARENT LOT ROOF AREA THAT IS ALLOWED TO BE DIRECTLY PIPED TO THE DISCHARGE POINT
1	1	PSD	PSD	75
	2	PSD	PSD	90
	3	PSD	PSD	90
	4	PSD	PSD	90
2	1	NDS #1b & #2	NDS #1b, #2 & PSD	50
	2	NDS #1b, #2 & PSD	NDS #2	25
	3	NDS #2	NDS #2 & #4	10
	4	NDS #2 & #4	PSD	50
	T2A	PSD	PSD	0
3	1	NDS #1b, #2 & PSD	NDS #1b, #2, #44 & PSD	0
	2	NDS #1b, #2, #44 & PSD	NDS #1d & PSD	0
	4	NDS #1d & PSD	POHD	70
	T4A	POHD	NDS #44 AND PSD	NA
5	1	NDS #44 AND PSD	PSD	50
	2	PSD		50
	3			50
	4		PSD	50
	5	PSD	NDS #44	25
	T5A	NDS #44	NDS #3 & #10	0
8	1	NDS #3 & #10		50
9	1	PSD		50
	2	PSD		50
	3	NDS #3		50
	4	SEE NOTE 1		NA
	5	SEE NOTE 1		NA
	6	SEE NOTE 1		NA
	7	NDS #10		50
	8	NDS #10		50
	T9A	PSD		50
10	T10A	NDS #3 & #4		0
	T10B	NDS #4		0

BLOCK	PARENT LOT	ALLOWABLE PERCENT IMPERVIOUS SURFACE COVERAGE (%) PER PARENT LOT	DESIGNATED PUBLIC DRAINAGE CONTROL SYSTEM FOR DISCHARGE POINT *SEE NOTE 2	PERCENT OF PARENT LOT ROOF AREA THAT IS ALLOWED TO BE DIRECTLY PIPED TO THE DISCHARGE POINT
10	1	NDS #3, #4, #5 & TRACT 10B		0
	2	NDS #3 & #5		10
	3	NDS #3, #5 & #12		10
11	1	NDS #5, #6 & #7a		10
	2	NDS #5 & #7a		25
	3	NDS #5, #7a & #14		35
12	1	NDS #7a, #7a & #8		15
	2	NDS #8		0
13	1	NDS #9 & #18		20
14	1	NDS #10		50
	2	NDS #10 & #11		50
	3	NDS #11		25
	4	NDS #11		50
	5	NDS #13a		50
	6	NDS #13a & #32		25
15	1	NDS #12, #13a & #13c		0
16	1	NDS #14 & #15		10
	2	NDS #13c		10
	3	NDS #15		25
	4	NDS #13a & #15		10
17	1	NDS #15, #16 & #20b		10
18	1	NDS #17, #18 & #19		25
	2	NDS #17, #19 & #20a		25
19	1	NDS #19 & PSD		95
20	1	NDS #13a & #13b		0
	2	NDS #13b		25
	3	NDS #13b		25
	4	NDS #13b & #30		0
21	1	NDS #13b, #20a & #21		0
	2	NDS #13b		10
	3	NDS #21		10
	4	NDS #13b & #21		15
22	1	NDS #21		10
	2	NDS #22		10
23	1	NDS #20b, #22 & #23		10
	2	NDS #22		20
	3	NDS #23		10
	4	NDS #22 & #23		10

DRAINAGE THRESHOLD NOTES:

1. Site improvements within +/-270 feet of the west property line drain to a PSD.
2. The Public Drainage Control System in the property includes a "Natural Drainage System" (NDS) numbered according to segment and a piped "Public Storm Drain" (PSD) system.
3. Dedicated footing drains can be connected to a PSD if they cannot daylight within 8 feet or more of the property line.
4. See approved Street Improvement Plans for detailed NDS location.
5. Drainage and utility easements are shown on sheets 6 through 22.

EXHIBIT B

SUMMARY OF DRAINAGE SYSTEM REQUIREMENTS

BLOCK	PARENT LOT	ALLOWABLE PERCENT IMPERVIOUS SURFACE COVERAGE (%) PER PARENT LOT	DESIGNATED PUBLIC DRAINAGE CONTROL SYSTEM FOR DISCHARGE POINT *SEE NOTE 2	PERCENT OF PARENT LOT ROOF AREA THAT IS ALLOWED TO BE DIRECTLY PIPED TO THE DISCHARGE POINT
24	1	50	NDS #23 & PSD	90
	2	50	NDS #23 & PSD	90
	3	50	NDS #23 & PSD	90
	T24A	50	NDS #23 & PSD	50
	T24B	50	NDS #23 & PSD	50
25	1	50	NDS #33	10
	2	50	NDS #34 & PSD	25
	3	50	NDS #34	20
26	1	50	NDS #35 & #36	10
	2	50	NDS #34 & PSD	10
	3	50	NDS #34 & #36	10
	T26A	50	NDS #36	0
27	1	60	NDS #36, #37 & #38	10
	2	60	NDS #36 & #37	10
	3	60	NDS #36, #37 & #38	20
28	1	60	NDS #24 & PSD	10
	2	60	NDS #29, #30 & PSD	10
	3	60	NDS #24, #29 & PSD	10
29	1	60	NDS #24 & #25	10
	2	60	NDS #25 & #26	10
30	1	60	NDS #23 & #26	10
31	1	60	NDS #27a & #28b	10
	2	60	NDS #27b	10
	T31A	60	NDS #28a & #28b	10
	T31B	60	NDS #27b & #23	0
32	1	60	NDS #23 & PSD	90
	2	60	NDS #23 & PSD	90
	3	60	NDS #23 & PSD	75
	4	60	NDS #23 & PSD	50
33	1	60	NDS #39 & #40	25
	2	60	NDS #40 & #41	25
	T33A	60	NDS #40 & #41	0
34	1	60	NDS #42	75
	2	60		90
	3	60		90
	4	60	PSD	90
	5	60		90
	6	60		100
	7	60		100
35	T35A	60	NA	NA

A. Applicability. In addition to the requirements of the Stormwater, Grading and Drainage Control Code, all land disturbing activities, and additions or replacement of impervious surface within the Property are subject to the drainage requirements set forth in the Drainage Covenant for Plat of High Point Community and the specific requirements for each lot established in the Final Plat.

B. Discharge Point and Method of Connection for Roof Downspouts and Site Drainage.

1. Drainage shall discharge to one or more of the public drainage control system facilities as designated by lot on this sheet, provided that only the drainage that cannot be conveyed to a natural drainage system with a minimum one percent slope may discharge to the public storm drain.
2. Stormwater from roof downspouts shall be conveyed through dispersed surface flow or infiltration trench to the discharge point, except that a portion of roof area drainage may be piped to the discharge point up to the maximum percentage of roof area that is stated on this sheet.

C. Flow Control.

1. Instead of the flow control requirements of SMC 22.802.015(C)(2) and SMC 22.802.016(B)(1), the provisions in this section apply.
2. For any development proposal that includes new or replaced impervious surface that causes the impervious surface coverage to exceed the percentage established by this sheet for the parent lot on which the development proposal is to be located, the City shall require as a condition of approval of the development proposal that a flow control facility must be installed and maintained for the amount of impervious surface by which (a) the total impervious surface including existing, replaced and proposed new impervious surface, exceeds (b) the equivalent area of impervious surface coverage limits established in the plat. The flow control facility shall be sized for at least the volume of runoff that is routed through it, (which shall be based on the area greater than or equal to (b) - (a)), and built in compliance with the peak drainage discharge rates in SMC 22.802.015(C)(2) (and in SMC 22.802.016(B)(1) if the amount is 5,000 square feet or more), as may at any time be amended or superseded, and in compliance with the terms of all applicable Directors' Rules. Any flow control facility that is a standard plan detention system or uses orifice plate technology must be sized for no less than 2,000 square feet of impervious surface.

D. Changes to plat. If any lot is re-divided, reconfigured through lot boundary adjustment, or a unit lot is aggregated with another unit lot or lots to form a larger building site, the percentage of impervious surface coverage for each new or reconfigured lot, parcel or site shall be the same as is established on this sheet for its parent lot. If the development proposed for the new or reconfigured lot, parcel or site would result in impervious surface coverage exceeding the percentage established for the parent lot, flow control shall be provided pursuant to paragraph C.2 above.

E. "Impervious surface" means any surface exposed to rainwater from which most water runs off including, but not limited to, paving, packed earth material, oiled macadam or other treated surfaces, and roof surfaces, patios, and formal planters. Porous surfaces, such as porous pavement and porous pavers, are not impervious surface for the purposes of calculating impervious surface coverage.

F. Technical Standards. Technical standards for compliance with these requirements are outlined in the High Point Drainage Basin Plan and Report located with the approved Street Improvement Plans.

G. Submittal of impervious surface coverage information. Applications for use or construction permits on property within the Plat of High Point Community shall contain information listing the amount of impervious surface coverage present as of the date of application on the parent lot upon which the development is proposed, and the amount of impervious surface coverage that will be added to the parent lot by the proposed development.

H. Exceptions to these requirements can be granted according to SMC 22.808.010, as may be at any time amended or superseded.

High Point Community: Site Drainage Technical Standards



APPENDIX C

Assumptions for sizing options

The following alternatives to the options outlined in this document shall be based on the following:

Impervious surface credit:

- Alternatives for impervious surface credit shall be sized to detain rainfall from the 25-year, 24-hour design storm event
- Amended soil infiltration rate = 1.0 inches per hour
- Drain rock infiltration rate >> Amended soil infiltration rate
- Maximum stormwater storage above soil = 6 inches and shall infiltrate within 24 hours
- 25-yr design storm event allowable discharge rate = (per City of Seattle code)

Downspout zone, conveyance zone and transition to ROW zone:

- Alternatives shall be sized to convey flows for the 2-year, 24-hour design storm event
- Alternatives intended to detain stormwater shall be sized to detain the 2-yr, 24-hr storm design event
- Conveyance zone shall be a minimum of 8 feet in length
- 2-yr design storm event allowable discharge rate = (per City of Seattle code)
- Amended soil infiltration rate = 1.0 inches per hour
- Drain rock infiltration rate >> Amended soil infiltration rate
- Flow velocity < 5 feet per second
- Level spreaders shall be a minimum of 2 feet in width
- Height of flow of level spreader shall be less than 1/4 inch



High Point Community: Site Drainage Technical Standards



APPENDIX D

Downspout examples



High Point Community: Site Drainage Technical Standards



High Point Community: Site Drainage Technical Standards



Rocks and landscaping reduce water velocity and soil erosion



This downspout does not meet requirements since water flows to an impervious surface



Elegant downspout slows water before it hits the vegetated area



The positive aspect of this treatment is the thick layer of mulch that reduces erosion, however it lacks a splashblock



Downspout is conveyed to a landscaped area, however a splashblock could be directing roof drainage away from the building



An otherwise effective design would improve erosion control with increased vegetation and soil amendments



High Point Community: Site Drainage Technical Standards



Splash block and conveyance area make this an effective design



More shrubs could help camouflage the length of pipe



Furrow serves more than one downspout



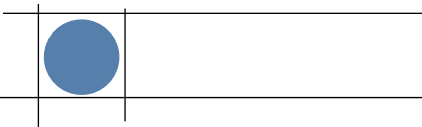
A simple, yet effective design for conveyance of roof runoff



River rock, landscaping and proper grading reduce erosion and direct flows toward a drainage area in the ROW



Boulders act as a terraced conveyance furrow



High Point Community: Site Drainage Technical Standards

